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Marine Review

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THE BUSINESS OF TRANSPORTATION BY WATER

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ELLIS SYSTEM

Your Guide To this Issue

The Diesel Engine

IN EUROPE there is no ordinary limit apparently, in size, speed, or class of ship, in which the diesel engine can be profitably employed. We have limited its use mostly to smaller vessels.

See Page 12

Engine Particulars

SIXTEEN different makes of diesel engines in 16 vessels, ranging in type from a new large twin screw tanker to a pilot boat, are illustrated and described.

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Ship Propulsion

AT A disadvantage in first cost diesel electric propulsion, particularly for certain services, is still far more economical than steam. An analysis for a recent diesel-electric fireboat brings this out forcibly.

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Marine Auxiliaries

ELECTRIC auxiliaries for ships have been developed to a high point of efficiency and reliability since the advent of the diesel engine for propulsion made their use practically a necessity.

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The Great Lakes

THESE waters are a great economic asset. It is important therefore, to be assured that though the levels recently reached new low records, there is now reason to expect a gradual rise.

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A Personal Sketch

LITTLE is known of the leaders in American marine affairs. An interesting, first hand, accurate, personal story about one of America's outstanding shipping men is given in this issue.

See Page 62

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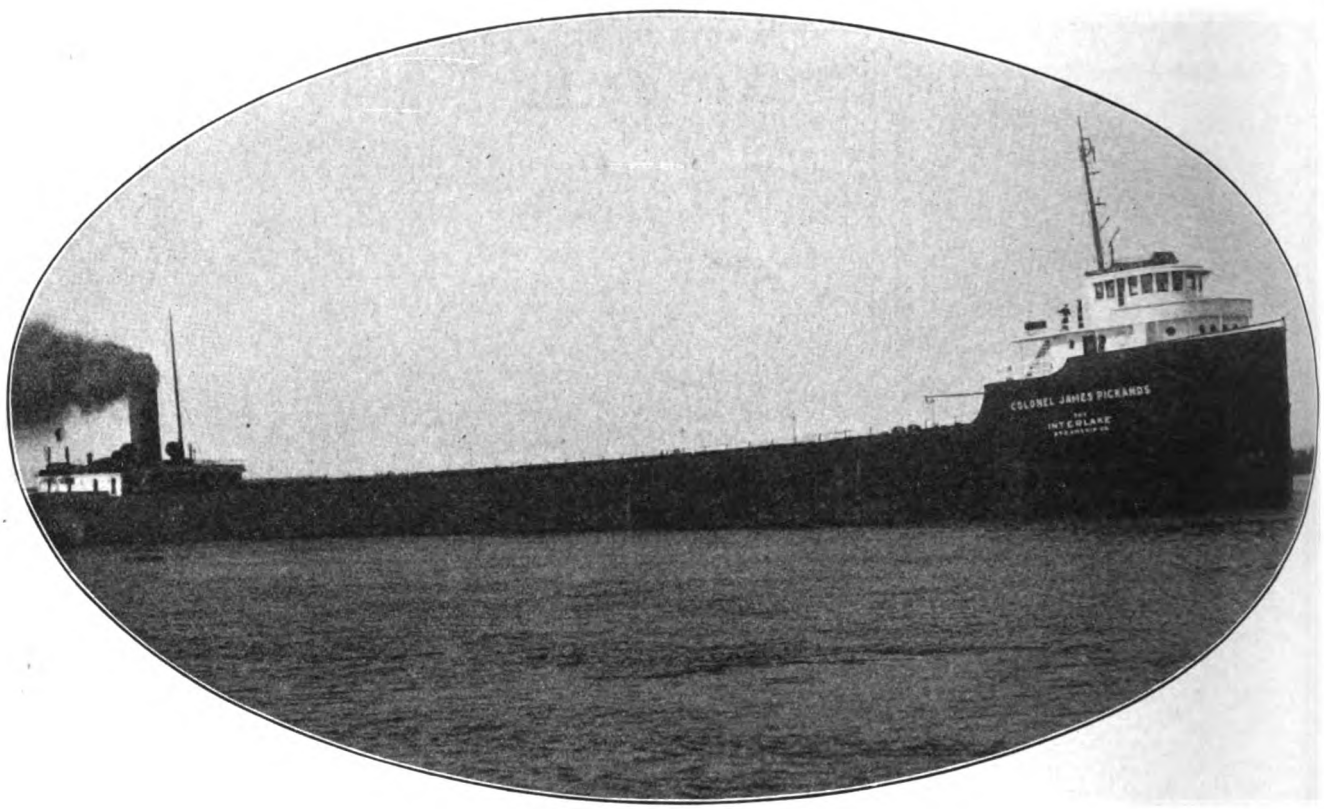
The American Ship



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Marine Diesel Engine

Insert section of the

November 1926 Issue

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New York **London** **Cleveland**

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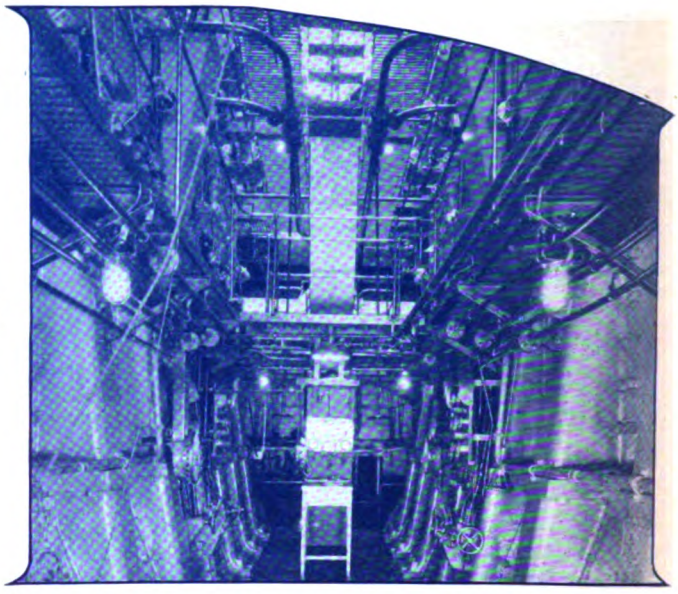
Diesel Engines Are Used with Complete Success in Many Classes of Marine Service



Engine room of the twin screw diesel tanker GULFCREST—13,895 tons deadweight—An American product throughout in design and construction of engines and hull—Completed 1926

ALL foreign maritime countries are keenly alive to the economic importance of adopting diesel engine drive for many classes of vessels. With motor vessels already representing about 50 per cent of the entire present world construction of shipping it is evident that the diesel engine as motive power for ships has come through its tentative period of questioning and distrust and is now accepted as a proven, suitable and highly efficient type of power for marine propulsion.

According to Lloyd's latest statement the tonnage of motorships building in Great Britain at the end of September amounted to 54.5 per cent of the steam tonnage then under construction. In other countries such as Sweden and Denmark 80 to 90 per cent of the total output of new vessels is of the diesel type. Italy will soon have in operation large and sumptuous passenger motor liners in the new SATURNIA and AUGUSTUS. The latter when completed will be the largest and highest powered oil engined vessel afloat.

Use Oil Engines in Large Vessels

Careful analysis of new ship construction in the United States for the year 1925 shows that nearly 31 per cent in number of steel vessels about 100 gross tons and over were fitted with diesel direct or diesel electric drive. Percentage in tonnage would, however, fall far below this figure as many of the diesel engine vessels in this list were harbor and bay and river craft.

The American steamship owner and operator is in a general way familiar with this condition and he is no doubt giving it serious consideration. There is no way of dodging the issue and at the same time continue to compete for long in any routes where the diesel engine can show greater efficiency. He must think seriously of dieselization or take the stand that the trend in this direction so evident all over the world is a mistake and is doomed to failure. In the face of actual experience, over long periods of time, in the successful operation of hundreds of motorships such a position is not tenable.

American Operator Is Conservative

Inventiveness, mechanical ingenuity and enterprise are traits which even foreigners will readily concede to Americans. We pretend to no monopoly of such characteristics but the industrial growth of the country surely indicates their presence. And yet there is apparently a certain conservatism in the development and acceptance of the practical possibilities of new ideas. This has been strikingly noticeable in regard to the adoption of the diesel engine for marine propulsion. Many factors enter into the reasons for this backwardness on the part of a progressive people.

The comparative ease with which capital and brains can find employment with a minimum of risk in many remunerative enterprises of a mechanical nature has tended to discourage their application with zeal and energy to the improvement of ship propulsion. Competition is of course the greatest incentive in a demand for greater efficiency. Due to the small amount of privately owned American tonnage in foreign trade this incentive has not existed to any marked degree. The very considerable merchant marine engaged in the domestic trade has been, and rightly so, protected against foreign competition. Any operator in this trade is not particularly interested

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in what is being done abroad as long as his fellow operator is content to continue in the usual way. With such conditions existing the remarkable development of diesel engines and diesel-electric units for ship propulsion, within a comparatively short period, by a number of large and small companies is very creditable. These companies have expended large sums of money and a great deal of labor and planning to perfect this type of propulsive power to lower operating cost on the chance and with the hope that by doing so the operator benefiting from this reduction would give them orders. Realizing the necessity of encouraging such development if the country is to be prepared to meet competition in foreign trade the shipping board two years ago ordered the conversion to diesel drive of 14 steam cargo ships of large size. The first completed vessel of this program will undergo sea trials about the end of October. And though the work has progressed very slowly the essential purpose of the project has been accomplished. Twelve marine diesel engines of considerable size (around 3000 brake horsepower) have been built or are under construction by five reputable and experienced engine builders. Four of these companies have had the practical experience of building the comparatively new type of double acting diesel engine making possible as demonstrated abroad the utilization of larger powers. When completed the government will have 12 modern diesel cargo ships of a type particularly suitable for liner service in foreign trade. The practical experience gained by the engine builders has materially advanced the art of building large size engines. The private operator is interested and the successful trials and operation of these ships will be of great value in establishing thorough confidence in the diesel engine for large cargo carriers. The several services of the American merchant marine in which the application of the diesel engine to marine propulsion should be considered may be enumerated as follows:

1. Passenger and cargo ocean liners, in service transatlantic, transpacific, intercoastal, to the West Indies, Mexico, Central America and to South America.
2. Cargo vessels in the same trade routes.
3. Tankers in the same trade routes.
4. Passenger and cargo vessels coastwise.
5. Cargo vessels on the Great Lakes.
6. Smaller vessels, such as tankers, freighters and ferries in rivers, bays, harbors and protected waters.
7. Tugboats, lighters, fire boats and smaller harbor craft of all types.
8. Cargo and passenger boats on inland rivers.
9. Special boats such as hydraulic dredges, sand suckers and snag boats.

(*Continued on Page* 94)

Sixteen Diesel Engines

THE ship owner and his naval architect are not specialists in diesel engineering, but they have definite ideas about the requirements of efficient propulsive and auxiliary machinery. The naval architect representing the owner is concerned about the overall propulsive and operating efficiency of the vessel he is designing. The questions a thoroughly qualified naval architect would ask of the engine builder are those which the owner is primarily interested in.

Within practical limitations of space there is presented in the following pages the answers to some of these questions for 16 *different makes of diesel engines installed in as many different vessels. The information given is authoritative as it was received directly from each engine builder.*

Diesel Ships—Where to Find Them

Freighters

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Tankers

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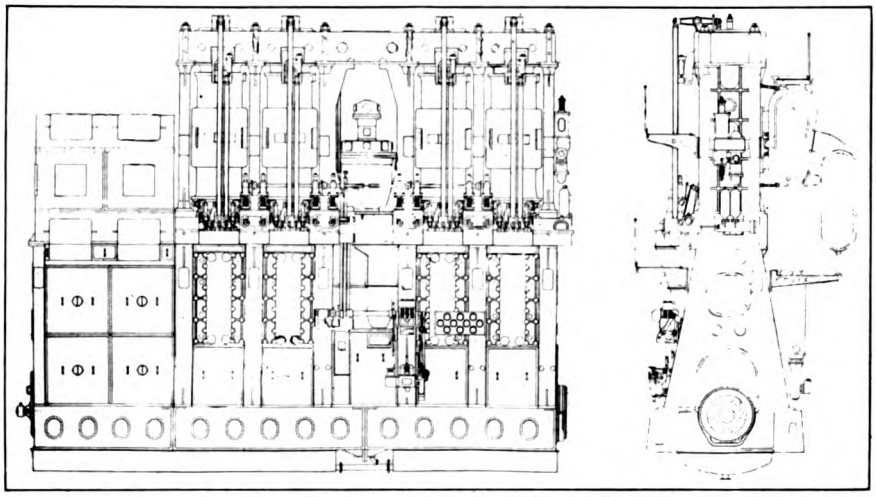
Diesel Direct Drive in U. S. S. B. Freighter

One Double Acting Engine—3300 B. H. P.



DESCRIPTION

One engine of this size and type direct-connected to the propeller shaft is to be installed in a 9500-ton Oscar Daniels hull as a unit in the shipping board's diesel program. This powerful engine is one of four working on the double acting principle developed by three American builders as a result of the conversion from steam to diesel initiated by the government.

Engine

Name of Engine—Hamilton M. A. N.; Year—1926
Builder—The Hooven, Owens, Rentschler Co.
Cycle—Two; **No. of Cylinders**—4; **I. H. P.**—4200
Injection—Air; **Scavenging**—Attached pumps
Piston Cooling—Fresh water; **Bore**—27½ in.
Stroke—47¼ in.; **R. P. M.**—95
Piston Speed—748 ft. p. m.; **Press. Ind.**—65
Pressure Brake—84; **I. H. P. per Cyl.**—1050
B. H. P. per Cyl.—825; **Mechanical Eff.**—78.5
Stroke to Bore—1.73; **Working Stroke per Rev.**—8
Lgth. O. A.—41 ft. 0 in.; **Width O. A.**—14 ft. 6 in.
Height—From center of crankshaft, 26 ft. 6 in.
Weight—one engine, 725,000 lbs.; one engine, 220 lbs. per B. H. P.; and 173 lbs. per I. H. P.
Reversing—By air, sliding cam shaft.
Air Compressor—Three stage vertical, attached.

Vessel

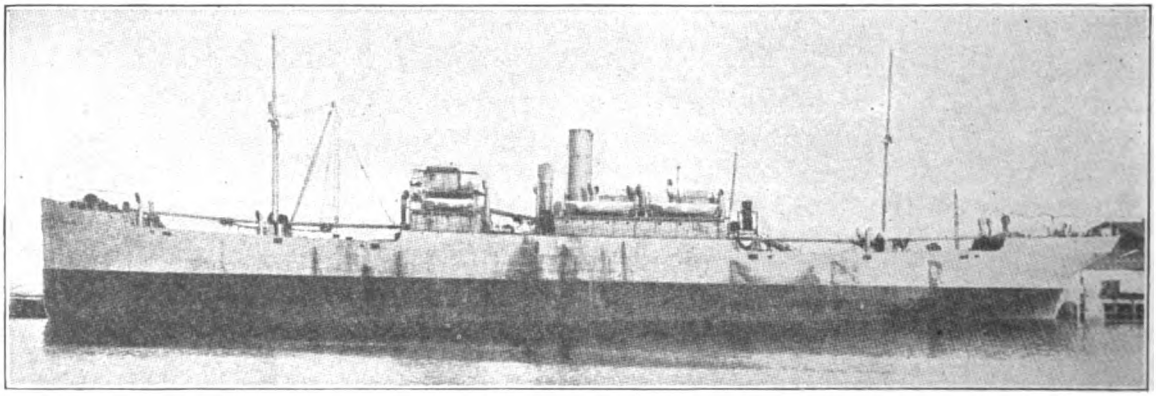
Name—Oscar Daniels Shipping Board Hull.
Main Drive—Direct Diesel; L. B. P. 402 ft.
Beam—54 ft.; **Depth**—33 ft. 9 in.
Draft—26 ft. 10¾ in.; **Displacement**—12,910 tons
Deadweight—9500 tons; **Speed**—11½ knots
No. of Propellers—One

Remarks

This engine is of the vertical marine type with built up crankshaft, marine style connecting rod and single crosshead guide. The framing consists of a lower housing supported on the bedplate with entablature setting on the housing, and above, upper columns connecting to the upper entablature. Supported by the upper and lower entablatures, the cylinders are set between the upper columns, allowing entire freedom of expansion and making a solid structure for absorbing the combustion pressure and load, which is taken up by through tie bolts keyed from the bottom of the bedplate to the upper part of the upper entablature.

The compressor of the vertical three-stage type with necessary intercoolers is located in the center of the engine. Operating gear placed at the middle of the engine, on the lower grating, controls the operation of the entire engine.

Driven through gearing from the main crankshaft at the center of the engine, the camshaft is located on the lower entablature. Fuel pumps are driven from the cam shaft.



One of the Oscar Daniels hulls of the United States shipping board before conversion

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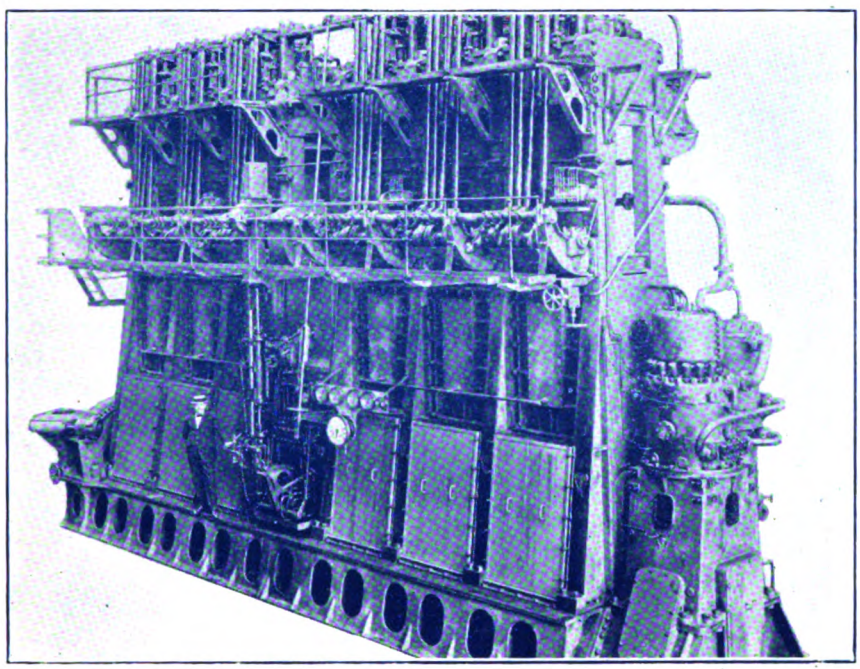
Diesel Direct Drive in Freighter Seekonk

One Engine—2300 I. H. P.



Engine

Name of Engine—Cramp-B. & W.; Year—1923
Builder—The William Cramp & Sons S. & E. Co.
Cycle—Four; **No. of Cylinders**—6; **Action**—Single
I. H. P.—2300; **Injection**—Air; **Bore**—29⅛ in.
Stroke—59 in.; **R. P. M.**—85
Piston Speed—836 ft. p. m.; **I. H. P. per Cyl.**—383.3
Stroke to Bore—2.03; **Wkg. Strokes per Rev.**—3

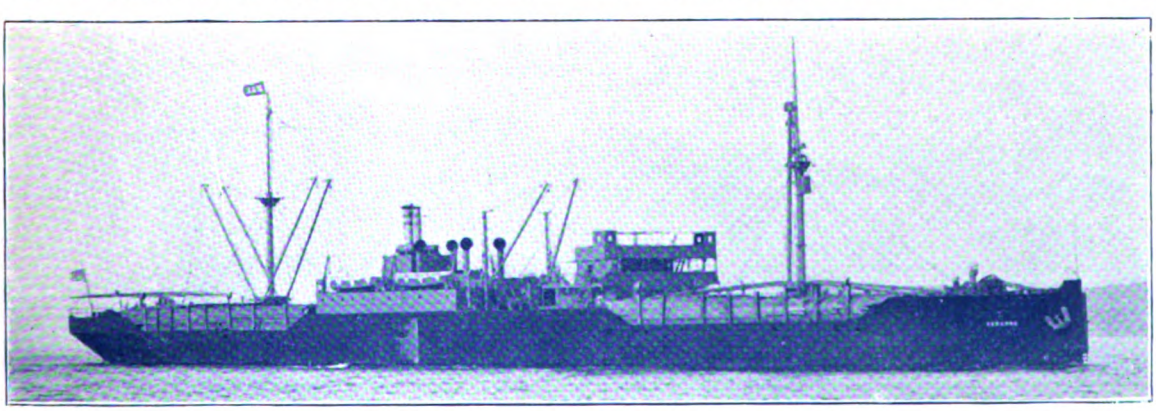
Vessel

Name—Seekonk, ocean freighter
Main Drive—Direct connected, diesel single screw
Length B. P. P.—390 ft.; **Beam**—54 ft.
Depth—32 ft.; **Draft**—24 ft. 4⅛ in.
Displacement—At load draft, 11,400 tons.
Deadweight—7690 tons; **Speed**—Sea load, 10¼ kts.
Fuel Consumption—Lbs. per I. H. B. per hr.—0.294, taken from actual service at sea; Tons per day—7.4
Generators—Three of 65-kilowatt capacity each, driven by three 100 B. H. P. two-cylinder Cramp B. & W. diesel engines; Electrical end built by Diehl Mfg. Co.

DESCRIPTION

One engine of this size and type was installed in the Hog Island class vessel SEEKONK by the Wm. Cramp & Sons Ship & Engine Building Co. in 1923. The engine, a Cramp-B. & W. diesel of long stroke and slow speed, developed for single screw vessels, was built by the Cramp company. In loaded condition in good weather the SEEKONK makes about 10½ knots with the propeller turning 86 revolutions per minute and the main engine developing 2300 I.H.P.

A comparison between the SEEKONK and the steamships of the Hog Island class indicates a striking advantage for the motorship. In a paper before the Society of Naval Architects, J. C. Shaw, member, summed it up as follows: "For an average sea speed of 10.25 knots the consumption of the motorship can be taken as 7⅛ tons and the steamer sister ship as 28 tons. With 53 per cent of the time at sea and 47 per cent of the time in port, etc., the fuel consumption on an annual basis, per diem, is about 19 tons for the steamer and 4½ tons for the diesel."



SEEKONK—Single screw—One 2300 indicated horsepower diesel engine direct connected to the propeller

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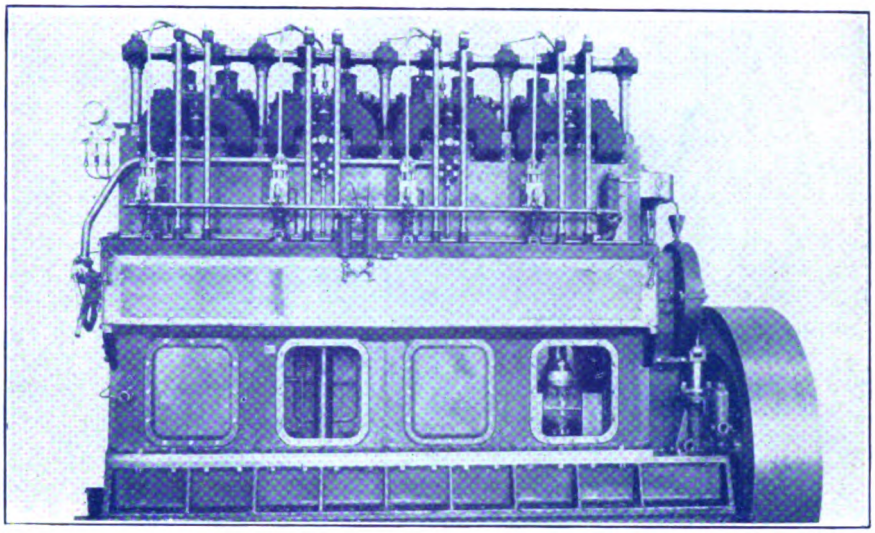
Diesel-Electric Drive in STEEL ELECTRICIAN

Three Engines—Each 320 B. H. P.



DESCRIPTION

Three engines of this size and type, each direct-connected to a generator, were installed in the STEEL ELECTRICIAN. The engine operates on the four-stroke cycle with mechanical injection and has four single-acting cylinders working on the full diesel principle. A compact, fully accessible unit, it is rigid without excess weight, simple in operation and easy to maintain.

Engine

Name of Engine—Nelseco 4-MI-22; Year—1926
Builder—The New London Ship & Engine Co.
Cycle—4; **No. of Cylinders**—4; **I. H. P.**—400
B. H. P.—320; **Action**—Single
Injection — Mechanical; **Piston Cooling** — None
Bore—15 in.; **Stroke**—22 in.; **R. P. M.**—225
Piston Speed—825 ft. p. m.; **Press. Ind.**—90.5
Pressure Brake—72.5; **B. H. P. Per Cyl.**—80
I. H. P. Per Cyl.—100; **Mechanical Eff.**—80%
Stroke to Bore—1.47; **Wkg. Strokes Per Rev.**—2
Lgth. O. A.—13 ft. 4 in.; **Hght. O. A.**—10 ft. 4½ in.
Width Over All—4 ft. 2 in.
Weight—One engine, 55,550 lbs. inc. flywheel
Reversing—Non-reversing; **Air Comp.**—Non fitted

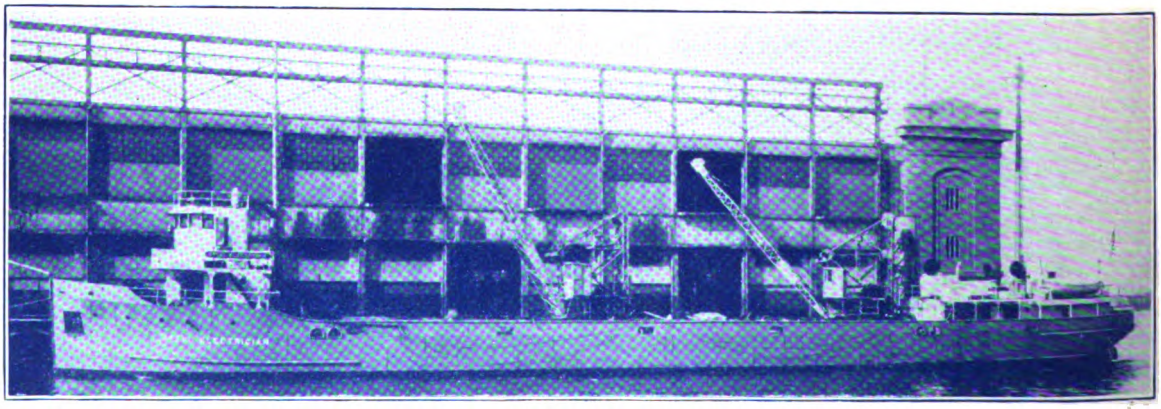
Vessel

Name — Steel Electrician, **Builder** — Federal Shipbuilding & Dry Dock Co.
Type—Special lake freighter
Main Drive—Diesel electric
Length B. P. P.—250 ft.; **Beam**—42 ft. 9 in.
Depth—20 ft.; **Draft**—14 ft.; **No. Propellers**—One
Fuel Consumption—Lbs. per B. H. P. per hr.—40 Lbs. per I. H. P. per hr.—.328; Tons per day—4
Generators—Three of 205 kilowatts each at 220 r.p.m.; Built by Westinghouse Electric & Mfg. Co.; Each genetator is driven by a diesel engine of size and type illustrated and described above.

Other Standard Sizes of Engines Built

				Single Action				
I. H. P.	B. H. P.	R. P. M.		No. Cyl.	Length O. A.	Height Above Shaft	Width	Approx. Weight
188/209	150/175	260/280	4-cycle	3	8 ft. 5¼ in.	6 ft. 9½ in.	6 ft. 7 in.	19,600
250/294	200/235	260/280	4-cycle	4	10 ft. 4¼ in.	6 ft. 9½ in.	6 ft. 7 in.	24,500
375/437	300/350	260/280	4-cycle	6	14 ft. 2¼ in.	6 ft. 9½ in.	6 ft. 7 in.	36,500
281/331	225/265	225/250	4-cycle	3	10 ft. 10⅛ in.	8 ft. 4½ in.	4 ft. 8 in.	32,700
375/344	300/355	225/250	4-cycle	4	13 ft. 3⅛ in.	8 ft. 4½ in.	4 ft. 8 in.	42,000
562/670	450/535	225/250	4-cycle	6	18 ft. 1⅛ in.	8 ft. 4½ ft.	4 ft. 8 in.	68,200

Also Double Acting with Attached Scavenging Pumps, from 2040 B. H. P. to 5520 B. H. P.



Steel Electrician—Single Screw—Three 320 B. H. P. Engines each connected to a generator

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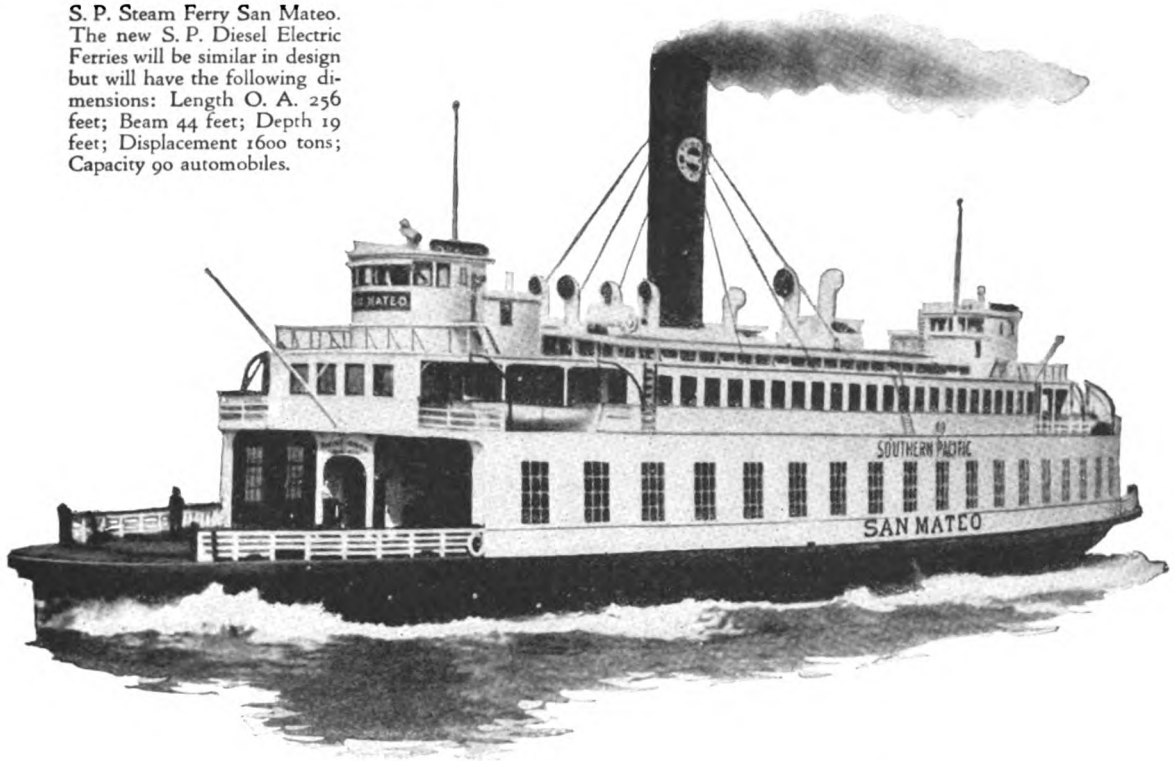
S. P. Steam Ferry San Mateo. The new S. P. Diesel Electric Ferries will be similar in design but will have the following dimensions: Length O. A. 256 feet; Beam 44 feet; Depth 19 feet; Displacement 1600 tons; Capacity 90 automobiles.



Southern Pacific Selects 24 Nelseco Diesels

These engines — 450 B. H. P., Type 6MI-22 — will power six Diesel Electric Ferries, the *largest* ever constructed.

These ferries will be used by the Southern Pacific Railroad Company in transporting automobiles across San Francisco Bay.

This order — totaling 10,800 H. P. — is the largest commercial contract for Marine engines ever placed in this country.

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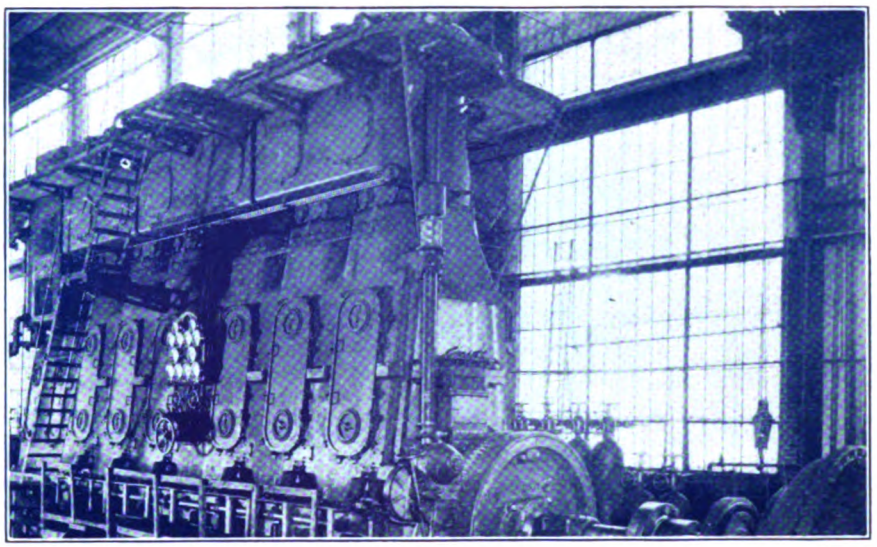
Diesel Direct Drive in M. S. Sawokla

One Engine—3600 B. H. P.



DESCRIPTION

One engine of this size and type direct-connected to propeller shaft. It is single acting, direct reversing vertical two-stroke cycle, port scavenging of crosshead type. A tandem double acting scavenging pump and a three stage injection air compressor in line with main cylinders are driven by separate cranks on the forward extension of the main crankshaft. The lubricating oil pumps are also driven by the shaft.

Engine

Name of Engine—6 CM—30 x 52; **Year**—1926
Builder—Busch Sulzer Bros. Diesel Engine Co.
Cycle—2; **No. of Cylinders**—6; **I. H. P.**—4800
B. H. P.—3600; **Action**—Single; **Injection**—Air
Scavenging—Double port scavenging
Piston Cooling—Water cooling; **Bore**—30 in.
Stroke—52 in.; **R. P. M.**—105; **Speed**—910 f. p. m.
Pressure Indicated—83; **Pressure Brake**—61.8
B. H. P. per Cyl.—600; **I. H. P. per Cyl.**—800
Mechanical Eff.—75%; **Stroke to Bore**—1.735
Wkg. Str. Per Rev.—6; **Length O. A.**—48 ft. 4 in.
Height—28 ft. 2¾ in.; **Width**—10 ft. 3 in.
Weight—One engine—900,000 lbs.; Per B. H. P.—250 lbs.; Per I. H. P.—188 lbs.
Reversing—Direct reversing
Air Compressor—3 stage, integral with engine

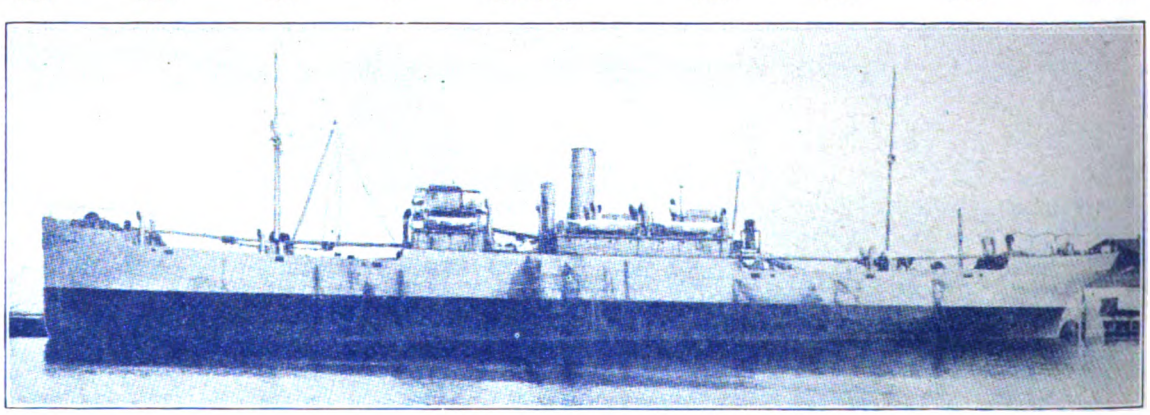
Vessel

Name—M. S. Sawokla; **Type**—Ocean cargo
Main Drive—Direct Diesel; **L. B. P.**—402 ft.
Beam—54 ft.; **Depth**—33 ft. 9 in.
Draft—26 ft. 10¾ in.; **Displacement**—12,910 tons
Deadweight—9500 tons; **Speed**—11½ knots
No. of Propellers—One
Fuel Consumption—Lb. per B.H.P. per hr.—0.413; under full load, shop test—Lb. per I. H. P. per hr.—0.304; tons per day—13.34.

Other Standard Sizes of Engines Built

Single Acting

I. H.P.	B. H. P.	R. P. M.	Cycle	No. Cyls.	L. O. A. ft. in.	Height ft. in.	Width ft. in.	Weight
3200	2400	105	2	4(30 x 52)	36-6	28-2¾	10-3	.....
6400	4800	105	2	8(30 x 52)	57-3	28-2¾	10-3	.....
3200	2360	125	2	4(30 x 42)	36-0	25-1	10-3	650,000
4800	3550	125	2	6(30 x 42)	46-6	25-1	10-3	.....
6400	4750	125	2	8(30 x 42)	55-0	25-1	10-3	.....



What the SAWOKLA looked like before conversion to diesel drive began

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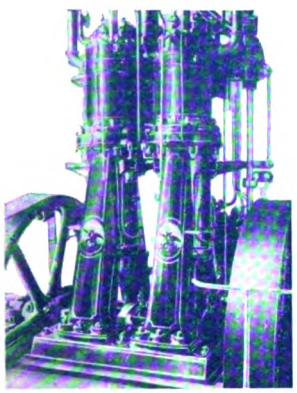
Experience Counts—

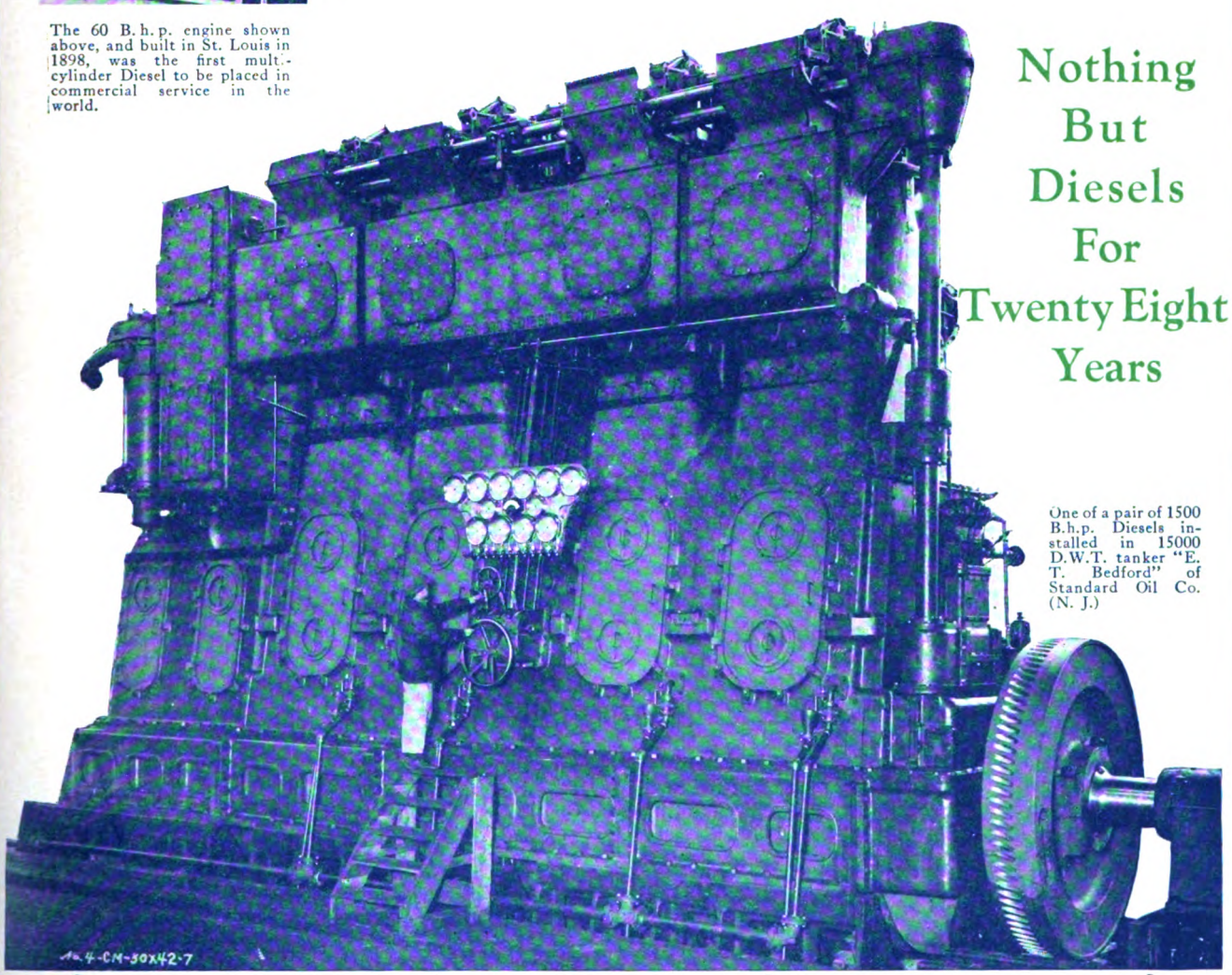
Ours dates from the beginning of Diesel Engines



The 60 B. h. p. engine shown above, and built in St. Louis in 1898, was the first multi-cylinder Diesel to be placed in commercial service in the world.

SINCE then we have gradually developed larger engines, building on the knowledge acquired and on proven results.

The engines we offer today are the product of that knowledge, not only of correct design, but of proper materials and exactness in manufacture.



Nothing But Diesels For Twenty Eight Years

One of a pair of 1500 B.h.p. Diesels installed in 15000 D.W.T. tanker "E. T. Bedford" of Standard Oil Co. (N. J.)

Busch-Sulzer Bros.—Diesel Engine Co.

ST. LOUIS, MO.

New York
2 Rector St.

San Francisco
Rialto Building

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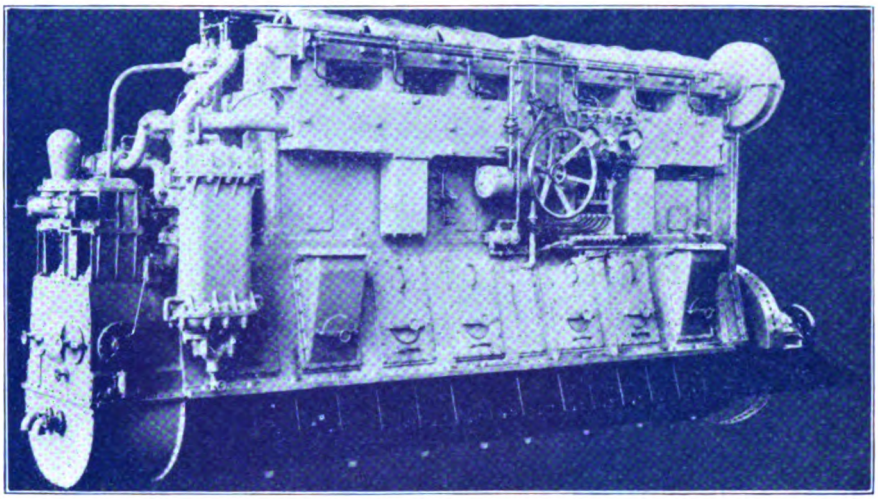
Diesel Direct Drive in Twin Screw Yacht Arcadia

Two Engines—Each 800 B. H. P.



DESCRIPTION

Two engines of this size and type, each direct-connected to separate propeller shafts, were installed in the diesel yacht ARCADIA. The engine is of full diesel type of four cycle and with air injection. A one-piece water box construction is used. The air compressor is direct-connected to the engine at the forward end and is driven from the main crankshaft.

Engine

Name of Engine—Winton; **Year**—1926
Builder—Winton Engine Co.; **Cycle**—4
No. of Cyls.—6; **B. H. P.**—800; **I. H. P.**—1120
Action—Single; **Injection**—Air
Piston Cooling—None; **Bore**—16½ in.
Stroke—22 in.; **R. P. M.**—300
Piston Speed—1100 f. p. m.; **Press. Ind.**—106
Pressure Brake—76; **B. H. P. Per Cyl.**—133.3
I. H. P. Per Cyl.—171; **Mechanical Eff.**—72%
Stroke-Bore—1.33; **Working Stroke Per Rev.**—3
L. O. A.—26 ft. 7¼ in.; **Height O. A.**—11 ft. 9¾ in.
Width Over All—62 in.
Weight—One engine, 110,000 lbs.; Lbs. per B.H.P. One engine—138; Lbs. per I. H. P., 98
Reversing—Air reversing
Air Compressors—Three-stage, direct-connected.

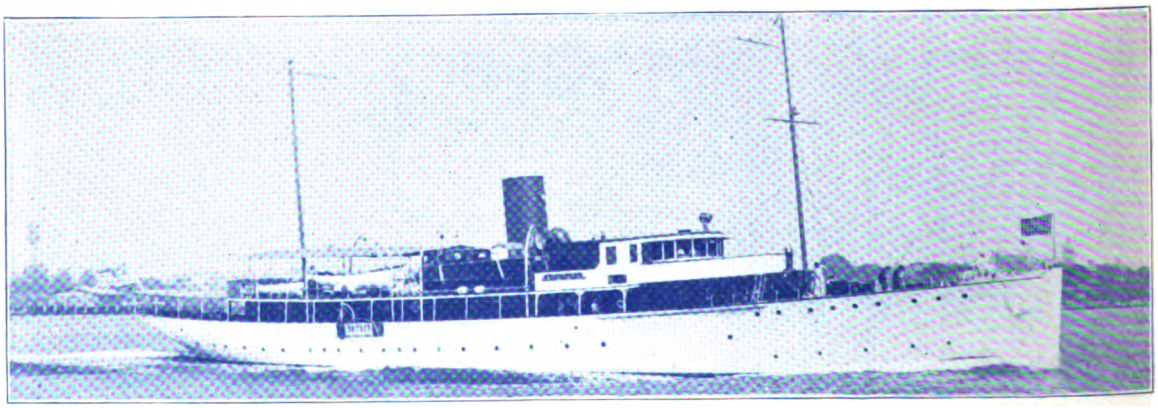
Vessel

Name—Arcadia; Built by Newport News S. B. & D. D. Co., from designs by Cox & Stevens
Type—Yacht, ocean going
Main Drive—Diesel direct; **Length B. P.**—177 ft.
Length O. A.—188 ft.; **Beam**—27 ft. 6 in.
Draft—11 ft.; **Speed**—16 knots
No. of Propellers—2; **Fuel Cap.**—1750 bbls.
Fuel Consumption—Lbs. per B.H.P. per hr.—0.48; Lbs. per I. H. P. per hr.—0.345; Radius without refueling—9000 miles.
Generators—Two of 25 kilowatts each at 450 r. p. m.; Built by Winton Engine Co.; Electrical end furnished by Westinghouse Elec. & Mfg. Co.

Some Other Sizes of Engines Built

Single Acting

MODEL	B. H.P.	R. P. M.	CYCLE	NO. CYLS.	L. O. A.	HEIGHT	WIDTH	WEIGHT
128	800	250	4	6	26′ 7¼″	11′ 9¾″	5′ 2″	110,000
121	400	250	4	6	22′ 7¼″	9′ 8″	4′ 3″	67,000
116	300	450	4	6	14′ 2⅞″	6′ 6¼″	3′ 6⅜″	21,500
115	600	425	4	6	20′ 6⅝″	7′ 10″	4′ 3″	42,000
W40	500	250	4	8	29′ 0¼″	9′ 10⅛″	5′ 10½″	90,000
W35	225	250	4	6	17′ 8⅛″	6′ 8″	3′ 5¾″	44,000
W24A	350	225	4	6	22′ 7¼″	9′ 8″	5′	65,000



Twin screw diesel yacht ARCADIA leaving Newport News on her trial trip

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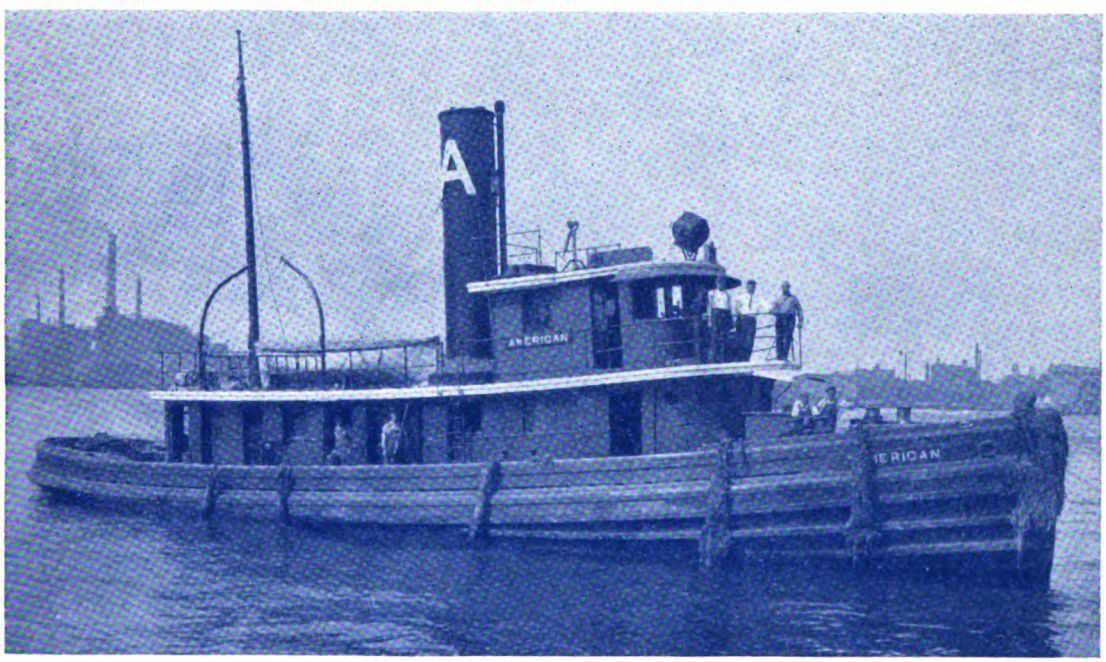
WINTON

Diesel-Engines



TOWBOAT American. Length, 81 ft. 1¼ in. Beam 20 ft. 9½ in. Draft 7 ft. Powered with one Winton Model 121, six cylinder, Full Diesel Type Engine, developing 300 H.P. at 210 R.P.M. Owned by The American Dredging Company, Philadelphia, Penn.

THE WINTON ENGINE COMPANY
CLEVELAND, OHIO, U. S. A.

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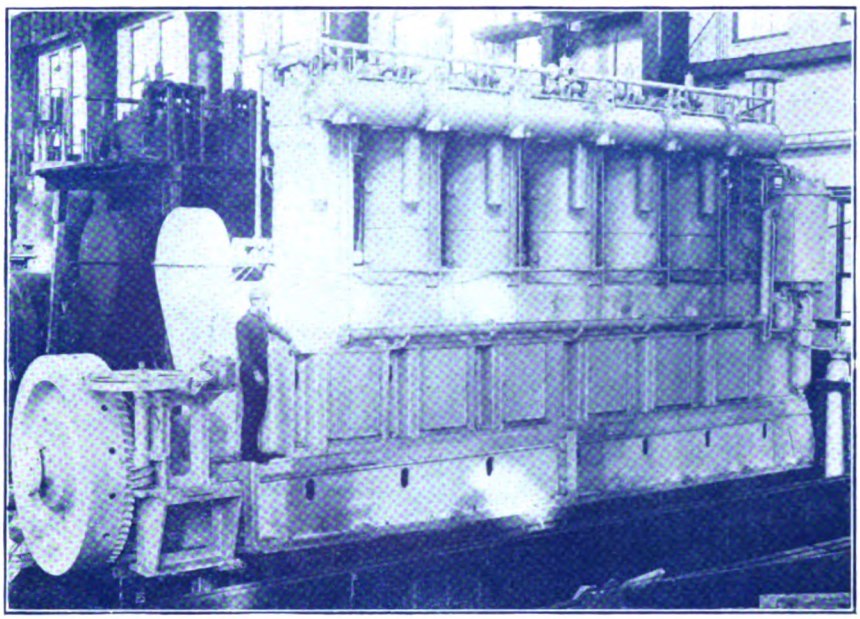
Diesel Direct Drive in Tanker Los Alamos

Two Engines—Each 750 B. H. P.



DESCRIPTION

Two engines of this size and type, each direct-connected to separate propeller shafts were installed in the tanker LOS ALAMOS. These engines are of box frame construction with ridged base and frame. Separate cylinders with removable liners are mounted on the frame. Attached compressors are driven by overhung cranks on the forward end of the engines.

Engine

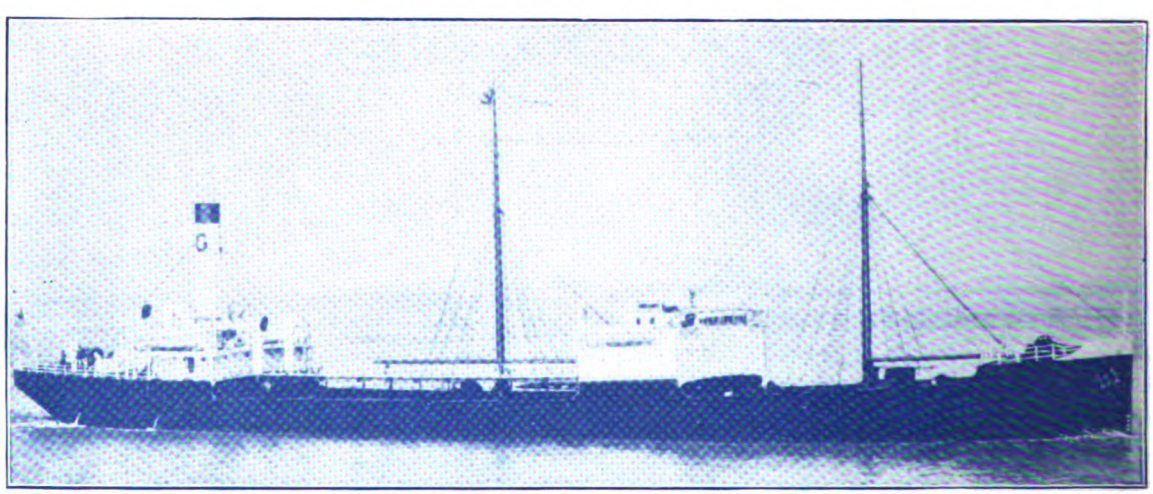
Name of Engine—McIntosh & Seymour
Builder—McIntosh & Seymour Corp.; **Cycle**—4
No. of Cylinders—6; **B. H. P.**—750; **I. H. P.**—960
Action—Single; **Injection**—Air; **Piston Coolg.**—Air
Bore—22 in.; **Stroke**—32 in.; **R. P. M.**—150
Piston Speed—800 ft. p. m.; **B. H. P.per Cyl.**—125
I. H. P. per Cyl.—160; **Mechanical Eff.**—78%
Stroke to Bore—1.45; **Wkg. Strokes per Rev.**—3
Lgth. O. A.—38 ft. 8 in.; **Hght. O. A.**—18 ft. 6 in.
Width Over All—9 ft. 11 in.
Reversing—Air reversing
Air Compressors—Three-stage attached

Vessel

Name—Los Alamos; **Builder**—The hull was built by the Baltimore Drydock & S. B. Co.
Type—Tanker
Main Drive—Diesel direct, twin screw
Length B. P. P.—292 ft, 3 in.; **Beam**—47 ft. 2 in.
Depth—28 ft. 1 in.; **Draft**—21 ft. 1 in.
Gross Tons—3262; **Deadweight**—5500 tons
No. of Propellers—Two; **Speed**—10 knots
Fuel Consumption—Lbs. per B. H. P. per hr.—0.45; Radius without refueling—16,000 miles.

Other Standard Sizes of Engines Built

Range from 100 to 10,000 B. H. P.



Twin screw diesel tanker LOS ALAMOS of the General Petroleum Corp., San Francisco

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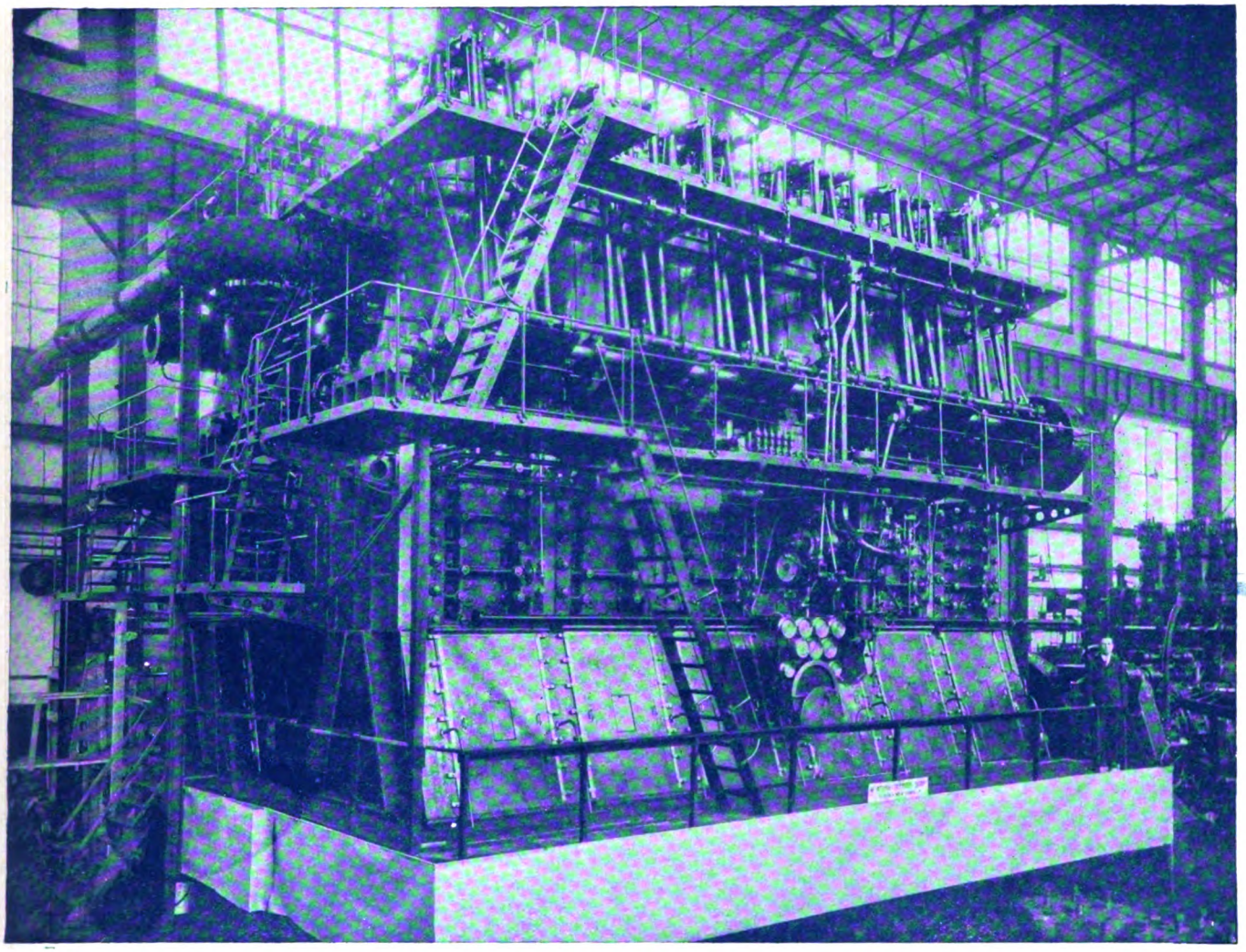

2700-B. hp.—One of the three recently completed for the U. S. Shipping Board

THESE engines have six cylinders of 32-in. diameter and 60-in. stroke, and operate at 95 r.p.m.

An independent compressor integral with a 400-b. hp. Auxiliary Diesel engine, also of McIntosh & Seymour build, furnishes starting and fuel injection air for both engines.

The unit immediately at the back was the first of the three completed and was tested in a 30-day non-stop run under supervision of the U. S. Shipping Board Engineers. *The tests on this initial unit were so satisfactory that the other two were subjected only to 24-hour tests.*

As these engines are the largest Diesels of the four-stroke-cycle type ever built in America, the test results prove that both McIntosh & Seymour design and McIntosh & Seymour workmanship are in the distinguished service class.

Your marine propulsion problems could safely be put into the hands that made these big engines an outstanding achievement.

BY INVITATION MEMBER OF
NEW YORK, U.S.A.

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McINTOSH & SEYMOUR DIESEL ENGINES

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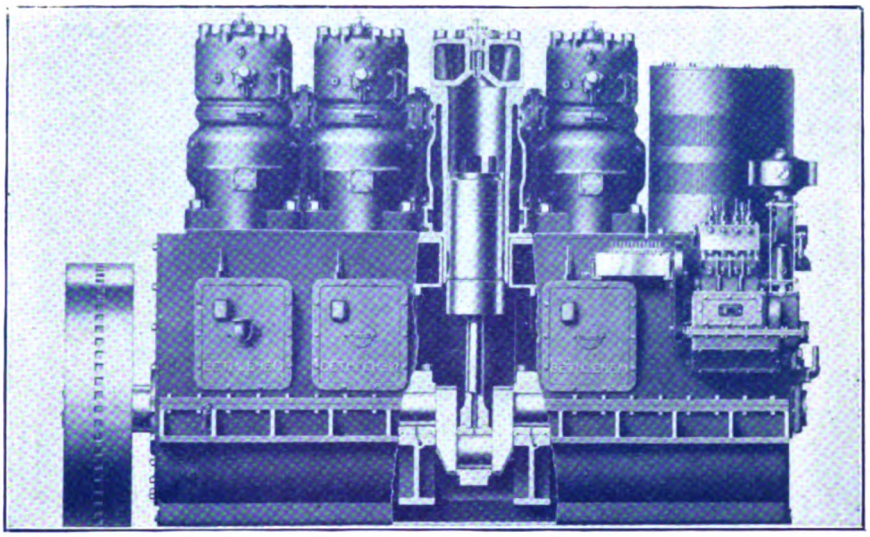
Diesel Direct Drive in Tug Hustler

One Engine—320 B. H. P.



DESCRIPTION

One engine of this size and type direct connected to the propeller shaft is installed in the tug HUSTLER. This tug is used for towing between Buffalo and New York via the state barge canal. Two-cycle oil engines of this type are especially adapted for installations requiring simple and reliable operation. Moving parts are reduced to a minimum.

Engine

Name of Engine—Bethlehem; **Year**—1926
Builder—Bethlehem Shipbuilding Corp. Ltd.
Cycle—Two; **No. of Cylinders**—4; **I. H. P.**—424
B. H. P.—320; **Action**—Single; **Injection**—Airless
Scavenging—Built in scavenging pump, port scav.
Cooling—None; **Bore**—14¼ in.; **Stroke**—21 in.
R. P. M.—220; **Piston Speed**—770 ft. p. m.
Pressure Indicated—60; **Pressure Brake**—45
B. H. P. per Cyl.—80; **I. H. P. per Cyl.**—106
Mechanical Eff.—75%; **Stroke to Bore**—1.475
Working Strokes per Rev.—4
Length O. A.—19 ft. 7 in. (inc. thrust and shaft)
Hght. O. A.—10 ft. 8½ in.; **Width O. A.**—6ft. 8¾ in.
Weight—One engine 53,000 lbs.; One engine, 165 lbs. per B. H. P.; One engine, 125 lbs. per I. H. P.
Reversing—Direct

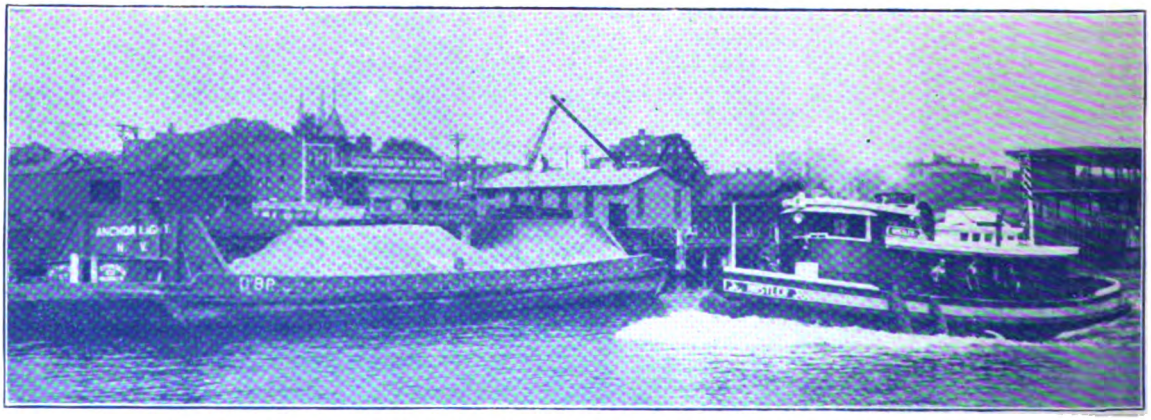
Vessel

Air Compressor—Attached—for starting air
Name—Hustler; **Type**—Tug, state barge canal
Main Drive—Diesel, direct-connected
Length B. P. P.—70 ft; **Beam**—17 ft. 6 in.
Depth—9 ft. 6 in.; **Draft**—9 ft.
Displacement—120 tons; **Speed**—12 knots
No. of Propellers—One; **Fuel Cap.**—6000 gals.
Fuel Consumption—Lbs. per B. H. P. per hr.—0.46.

The engine illustrated above of two-cycle airless-injection type is simple in construction.

Standard Sizes of Small-Unit Marine Engines Built

Model	B. H. P.	R. P. M.	Cyls.	Bore	Stroke	Length	Height	Width	Weight
4-30-M	120	400	4	8¼ in.	12 in.	12 ft. 0 in.	6 ft. 4 in.	4 ft. 6 in.	15,500
6-30-M	180	400	6	8¼ in.	12 in.	15 ft. 2 in.	6 ft. 4 in.	4 ft. 6 in.	20,200
3-30-M	180	285	3	11½ in.	18 in.	13 ft. 11 in.	9 ft. 1 in.	5 ft. 10 in.	23,700
4-60-M	240	285	4	11½ in.	18 in.	16 ft. 4 in.	9 ft. 1 in.	5 ft. 10 in.	29,000
6-60-M	360	285	6	11½ in.	18 in.	20 ft. 10 in.	9 ft. 1 in.	5 ft. 10 in.	40,000
3-95-M	285	250	3	14¼ in.	21 in.	16 ft. 8 in.	11 ft. 4 in.	6 ft. 9 in.	42,800
4-95-M	380	250	4	14¼ in.	21 in.	19 ft. 7 in.	11 ft. 4 in.	6 ft. 9 in.	52,300
6-95-M	570	250	6	14¼ in.	21 in.	25 ft. 0 in.	11 ft. 4 in.	6 ft. 9 in.	69,500



Tugboat HUSTLER used in towing through barge canal between New York and Buffalo

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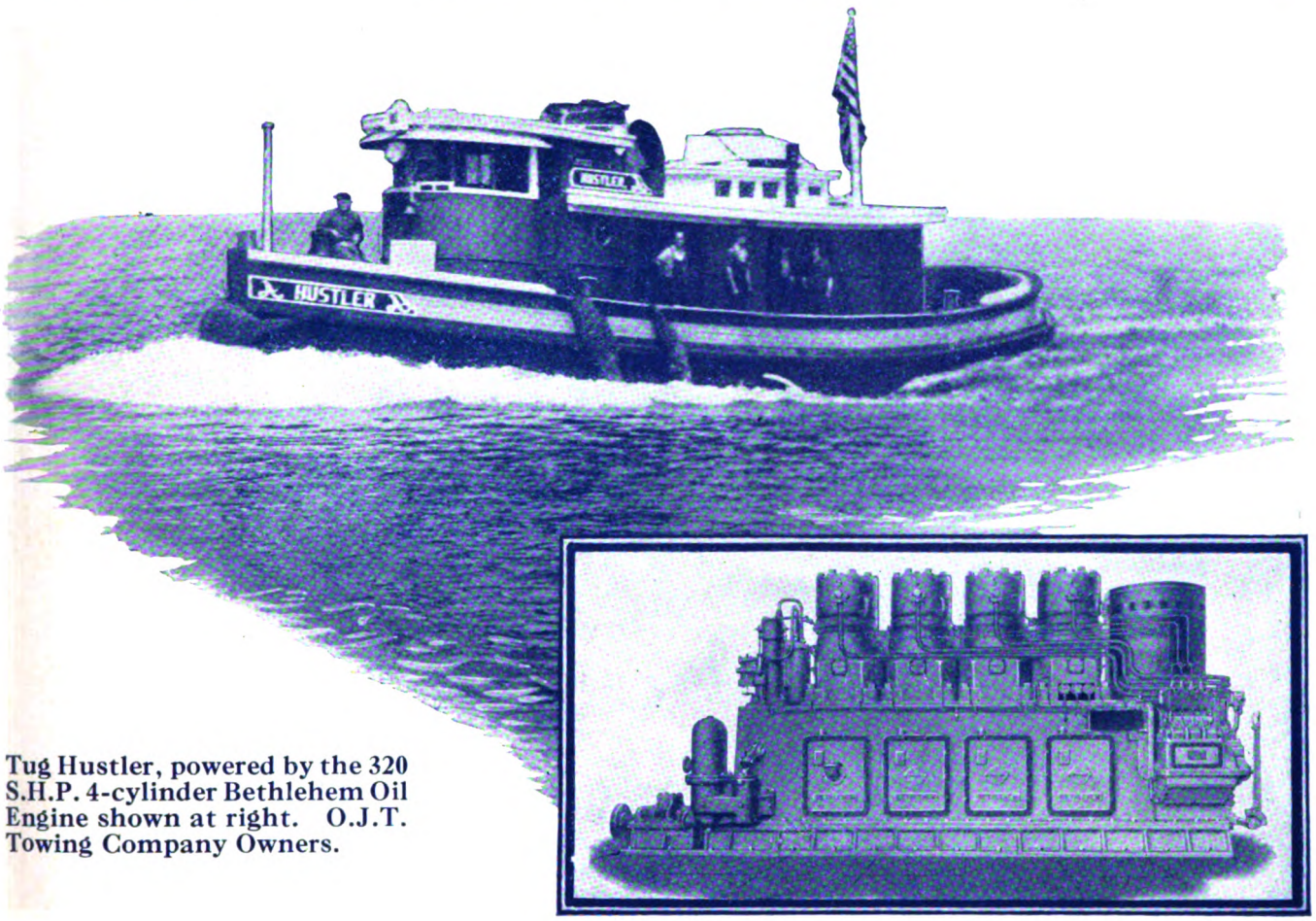

Tug Hustler, powered by the 320 S.H.P. 4-cylinder Bethlehem Oil Engine shown at right. O.J.T. Towing Company Owners.

Economy Insurance!

THE installation of a Diesel engine is an economy insurance in tug operation.

All standby losses are eliminated.

Cruising radius is greatly increased on a lower average weight of fuel carried, necessitating less frequent refueling.

Lower fuel weight means lighter draft, making operations possible in shallower water than that required by a steam tug.

Bethlehem Oil Engines

Small Unit Type

Built in 3, 4 & 6 cylinder units

Sizes range from 90 to 570 S.H.P.

The Bethlehem Oil Engine (Small Unit Type) is a two stroke cycle airless fuel injection type of engine, unusually simple in design and operation. It is equipped with a built-in scavenging pump supplying to the cylinders, an excess amount of scavenging air, which is in no way contaminated by passing thru the crank case.

Our Engineers will gladly furnish detailed information on request.

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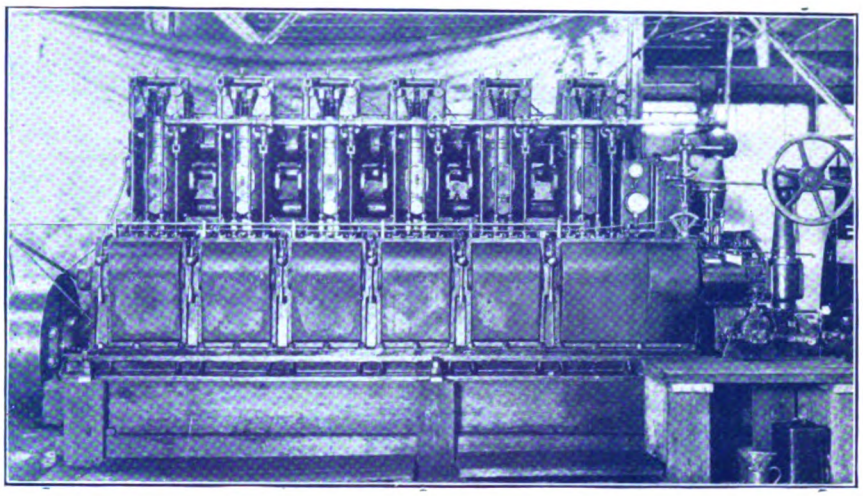
Diesel Direct Drive in Tug Walnero No. 4

One Engine—150 B. H. P.



DESCRIPTION

One engine of this size and type direct connected to the propeller shaft was installed in the tug WALNERO No. 4. The engine is of full diesel four-cycle mechanical injection direct reversing marine type. By progressive arrangement of air and oil feed the engine is capable of overload in handling and starting, an advantage in tugs.

Engine

Name of Engine—Standard; Year—1926
Builder—Standard Motor Construction Co.
Cycle—4; **No. of Cyls.**—6; **I. H. P.**—185
B. H. P.—150; **Action**—Single
Injection—Mechanical; **Piston Cooling**—None
Bore—8½ in.; **Stroke**—12 in.; **R. P. M.**—350
Piston Speed—700 ft. p. m.; **Press. Ind.**—102
Pressure Brake—83; **B. H. P. per Cyl.**—25
I. H. P. per Cyl.—30.8; **Mechanical Eff.**—81%
Stroke to Bore—1.41; **Wkg. Strokes per Rev.**—3
Lgth. O. A.—14 ft. 2 in; **Hght. O. A.**—6 ft. 5 in.
Width Over All—4 ft. 2 in.
Weight—One engine, 18,000 lbs.; Lbs. per B. H. P. per hour, 120; Lbs. per I. H. P. per hour, 97.4
Reversing—Direct reversing
Air Comp.—Attached, 3¾ in. bore x 3½ in. stroke

Vessel

Name—Walnero No. 4; **Type**—Barge canal tug
Main Drive—Diesel direct; **Length B. P.**—60 ft.
Beam—16 ft.; **Depth**—9 ft 6 in.; **Draft**—8 ft.
Speed—9 knots; **No. Propellers**—One
Fuel Capacity—3000 gallons
Fuel Consumption—Lbs. per B. H. P. per hr.—0.45; Radius without refueling—22 days
Generators—None

The WALNERNO, a wooden tug owned by Portland Canal Transportation Co., is engaged in towing five and six barges through the New York state barge canal between New York City and Buffalo. Five barges loaded with 100,000 bushels of grain are handled at 4.4 miles per hour. The diesel engine illustrated and detailed above has mechanical injection with positive pulverization.

Other Standard Sizes of Engines Built

B. H. P.	R. P. M.	Cycle	No. Cyls.	Bore	Stroke	Weight
90	350	4-cycle	4	8½ in.	12 in.	14,500
135	350	4-cycle	6	8½ in.	12 in.	20,000
200	300	4-cycle	6	10 in.	14 in.	24,000
300	275	4-cycle	6	12 in.	17 in.	36,000

Diesel tug boat WALNERO for service between New York and Buffalo via the barge canal

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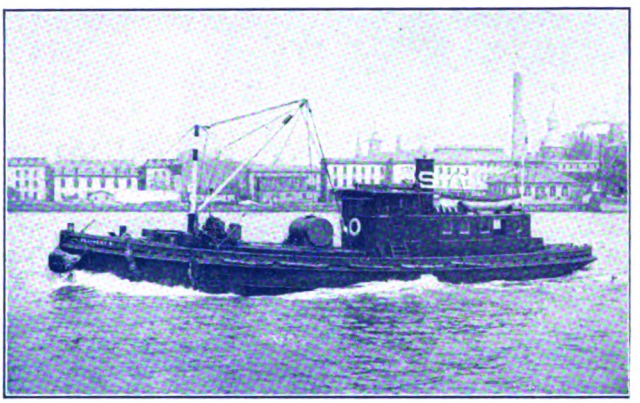
Standard Oil Engine Full Diesel



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Good judgment demands your taking advantage of the profits to be had by installing a Standard full Diesel. The fuel and lubricating oil saved, the loss of time coaling or watering, together with always available maximum power in response to the throttle. Direct reversing, no gears, labor saved in attendance and low cost of up-keep, together with many other features exclusively had in the Standard Engine pay dividends that liquidate the first cost in one to three years.

Write for catalogue and consult one of our engineers— it costs nothing.

Back of Standard Gasoline & Oil Engines Is the

Standard Motor Construction Co.

184 Whiton Street **Jersey City, N. J., U. S. A.**

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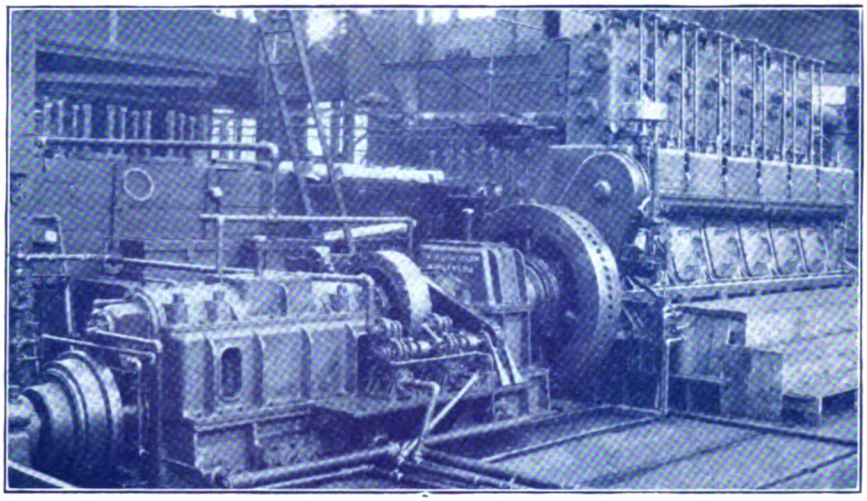
Diesel Geared Drive in Pilot Boat Carmina

One Engine—400 B. H. P.



DESCRIPTION

One engine of this size and type connected to propeller shaft by reversing and reduction gears and Metten hydraulic clutches was installed in the pilot boat CARMINA. This engine is four-cycle, and of solid injection type. It is simple and reliable. Engines of the same principle have been tried out under severe condition of service.

Engine

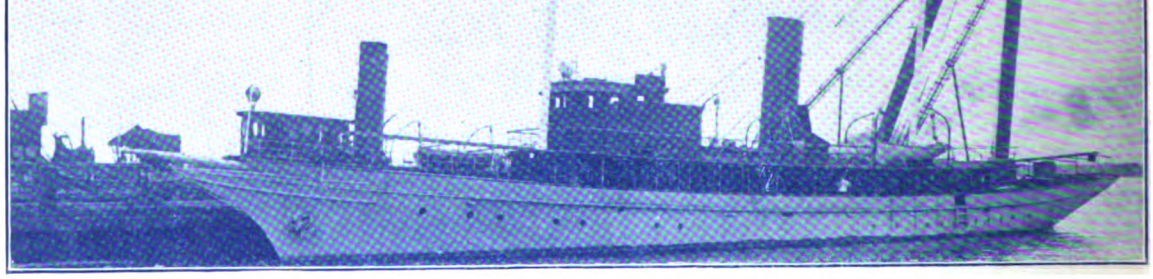
Name of Engine—De La Vergne; **Year**—1926
Builder—De La Vergne Machine Co.; **Cycle**—4
No. Cyls.—6; **B. H. P.**—400; **I. H. P.**—470
Action—Single; **Injection**—Solid
Piston Cooling—None; **Bore**—14½ in.
Stroke—18 in.; **R. P. M.**—277
Piston Speed—875 ft. p. m.; **Press. Ind.**—73.5
Pressure Brake—62.5; **B. H. P. per Cyl.**—65
I. H. P. per Cyl.—76.5; **Mechanical Eff.**—85%
Stroke to Bore—1.24; **Wkg. Strokes per Rev.**—3
Length O. A.—32 ft. 2 in. (including gear)
Height O. A.—8 ft. 4¾ in.; **Width O. A.**—56 in.
Weight—One engine, including flywheel, 60,000 lbs.; Lbs. per B. H. P. one engine, 150; Lbs. per I. H. P. one engine, 128; All machinery, 92,000 lbs.; Lbs. per B. H. P., 230
Reversing—Non-reversing
Air Compressors—Auxiliary for starting

Vessel

Name—Carmina; built in 1903 as a steam yacht.
Type—Yacht, adapted as pilot boat
Main Drive—Diesel with gears and clutch
Length O. A.—168 ft.; **L. B. P.**—140 ft. 1 in.
Beam—21 ft. 6 in.; **Draft**—9 ft. 11 in. aft
Deadweight—260 tons; **Speed**—12.6 knots
Fuel Consumption—0.45 lbs. per B. H. P. per hour; 0.383 lbs. per I. H. P. per hour; 2.16 tons per day at full load; Radius without refueling—50 days' cruising time for pilot boat service.

Other Standard Sizes of Engines Built

I. H. P.	B. H. P.	R. P. M.	Cycle	No. of Cyl.	Length O. A.	Height	Width	Weight
470	400	277	4-cycle	6	19 ft. 8½ in.	8 ft. 4¾ in.	56 in.	54,000
354	300	225	4-cycle	8	13 ft. 11¾ in.	12 ft. 2½ in.	6 ft. 6 in.	47,000
470	400	225	4-cycle	4	16 ft. 11¾ in.	12 ft. 2½ in.	6 ft. 6 in.	77,000
590	500	225	4-cycle	5	19 ft. 11¾ in.	12 ft. 2½ in.	6 ft. 6 in.	100,000
705	600	225	4-cycle	6	22 ft. 11¾ in.	12 ft. 2½ in.	6 ft. 6 in.	113,000
665	565	180	4-cycle	3	18 ft. 3 in.	14 ft. 3⅞ in.	8 ft. 6 in.	100,000
885	750	180	4-cycle	4	22 ft. 0 in.	14 ft. 3⅞ in.	8 ft. 6 in.	135,000
1100	940	180	4-cycle	5	25 ft. 9 in.	14 ft. 3⅞ in.	8 ft. 6 in.	175,000
1325	1125	180	4-cycle	6	29 ft. 6 in.	14 ft. 3⅞ in.	8 ft. 6 in.	195,000



Pilot boat CARMINA at Kensington yard, Philadelphia after conversion to diesel drive

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Sizes up to 1125 H.P. are available. These engines are NON-REVERSIBLE and specially designed for electric regulation, and for reduction and reversing gear drive, where variation of speed and manoeuvering are desirable (without the complication of the direct reversible engine), thereby enabling us to produce at LESS COST AND WEIGHT per H.P.

Small engines specially adapted for driving generators for providing electric power for auxiliaries for ships of all types.

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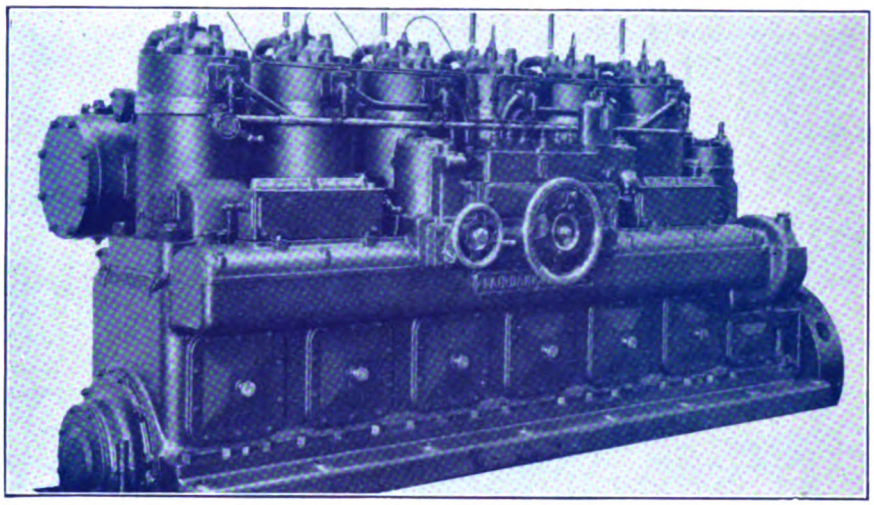
Diesel Direct Drive in Tug W. H. Hoodless

One Engine—360 B. H. P.



DESCRIPTION

One engine of this size and type, direct-connected to the propeller shaft, was installed in the tug W. H. HOODLESS, owned and operated by Capt. S. C. Loveland, Philadelphia. The engine is of the two-cycle airless injection type with port scavenging and trunk pistons. Simplicity is the dominant feature of the design. Operating control is centralized.

Engine

Name of Engine—Fairbanks, Morse; **Year**—1926
Builder—Fairbanks, Morse & Co.; **Cycle**—Two
No. of Cylinders—6; **B. H. P.**—360; **Action**—Single
Injection—Airless
Scavenging—Port, crankcase for engines 360 horsepower and below. Scavenging pump for engines 480 to 720 brake horsepower
Piston Cooling—None, fitted only in engines 480 b. h. p. and larger.
R. P. M.—250; **B. H. P. per Cyl.**—60
Wkg. Strokes per Rev.—6; **Lgth. O. A.**—18. ft. 4 in.
Height—7 ft. 5 in.; **Width**—7 ft. 1 in.
Weight—One engine, 53,450 lbs. including flywheel; One engine, 148.5 lbs. per b. h. p.
Reversing—Direct; **Air Comp.**—Built in

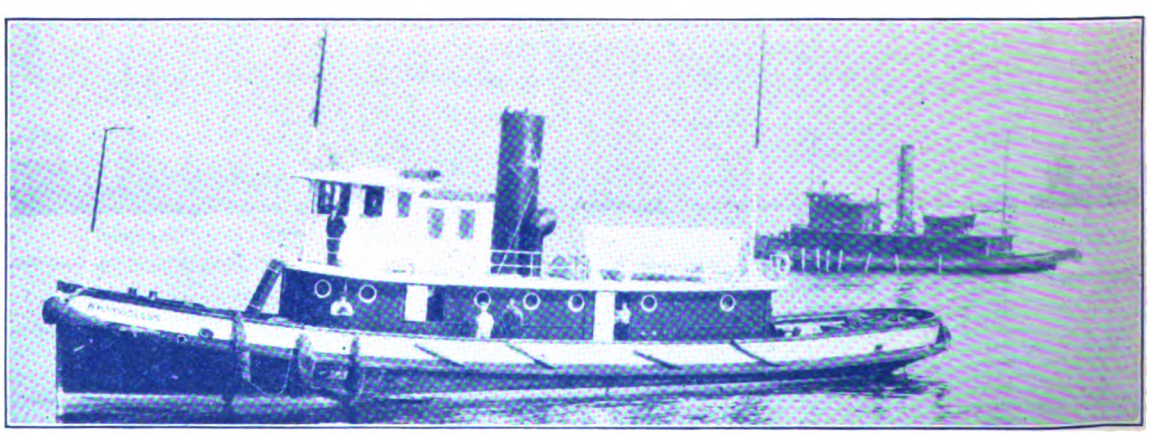
Vessel

Name—W. H. Hoodless; **Type**—Towboat
Main Drive—Diesel engine direct connected
Length B. P. P.—79 ft.; **Length O. A.**—86 ft.
Beam—20 ft.; **Depth**—10½ ft.; **Draft**—12 ft.
No. of Screws—One; **Fuel Cap.**—10,000 gals.
Fuel Consumption—Lbs. per B. H. P. per hr.—0.46
Generator—One of 9 kilowatts driven by a 15 horsepower Fairbanks-Morse engine
Bilge and Fire Pump—Centrifugal, 2½ in. discharge against 50-foot head. Pump furnished by the Morris Machine Works. The pump is driven by a General Electric 15-h.p. motor.

Standard Sizes of Diesel Engines Built

B. H. P.	R. P. M.	Cycle	No. Cyls.	L. O. A.	Height	Width	Weight
120	360	2	4	9 ft. 11¾ in.	5 ft. 6¼ in.	5 ft. 1 in.	14900
180	360	2	6	13 ft. 0 in.	5 ft. 6¼ in.	5 ft. 1 in.	21050
240	250	2	4	14 ft. 6½ in.	7 ft. 5 in.	7 ft. 1 in.	38300
360	250	2	6	18 ft. 7 in.	7 ft. 5 in.	7 ft. 1 in.	53450
480	257	2	4	*15 ft. 10 in.	10 ft. 0 in.	7 ft. 11 in.	.....
600	257	2	5	.....	10 ft. 0 in.	7 ft. 11 in.	.....
720	257	2	6	*20 ft. 10 in.	10 ft. 0 in.	7 ft. 11 in.	.....

*Without flywheel.



Diesel towboat W. H. HOODLESS—One 360 brake horsepower two cycle engine

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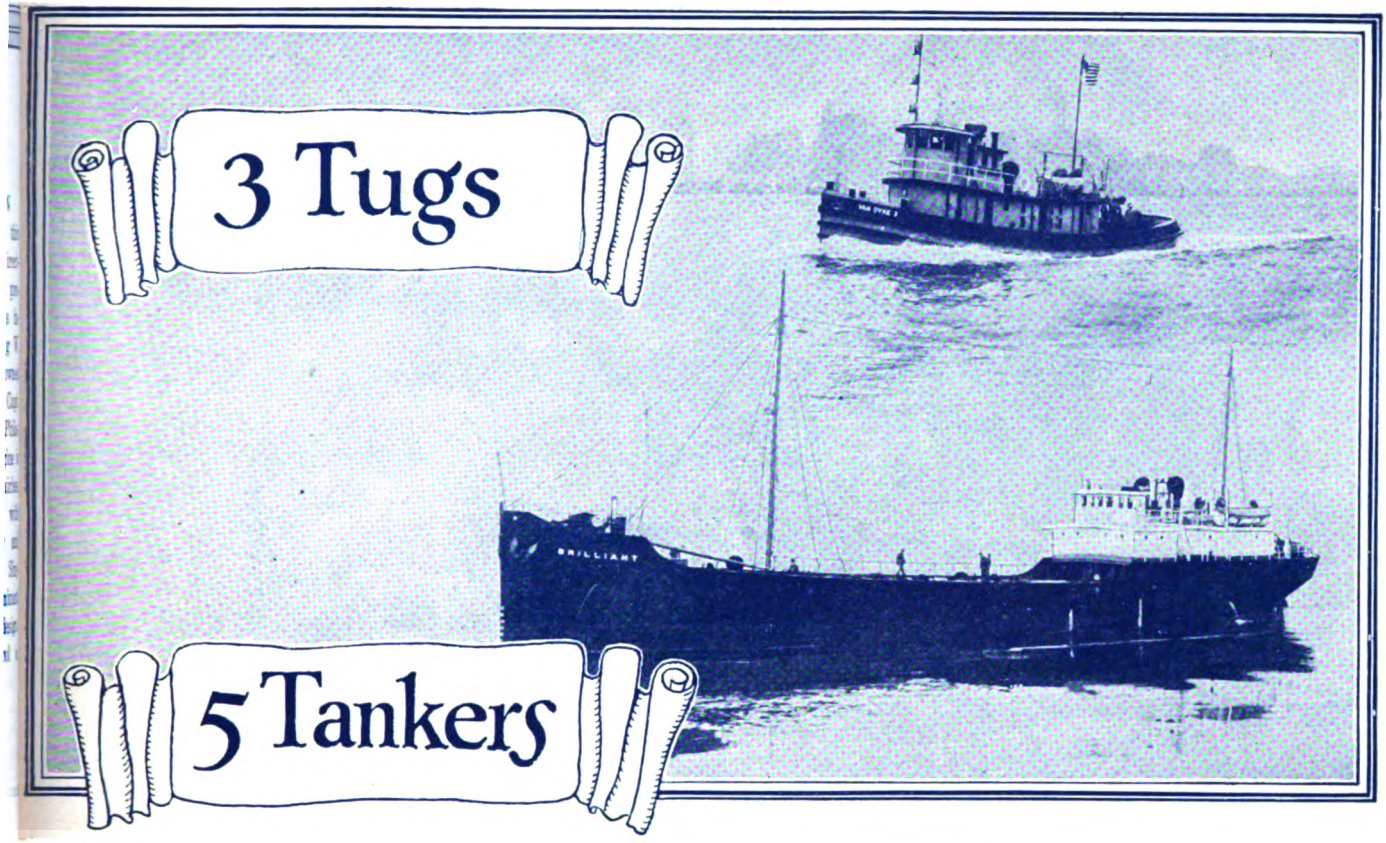

8 out of 24 – *Diesel-electric*

Since 1923, only Diesel-electric drive has been specified by the Atlantic Refining Company, for new ships and for conversions. With the conversions of the tankers *Sharon, J. M. Connelly,* and *Bessemer,* one-third of this company's fleet of 24 ships will be Diesel-electric.

These three 7000-ton tankers were recently purchased from the U. S. Shipping Board for operation in transatlantic service. The decision to convert the drive to Diesel-electric was based largely on this company's experience with its Diesel-electric tanker *Brilliant* and three Diesel-electric tugs, all of which are G-E equipped.

Each of the big tankers will also be fitted with more than 300 h.p. of electric auxiliaries, all driven by G-E Motors and Control.

Each year more ship operators are learning by experience the economical advantages of specifying G-E Equipment throughout.

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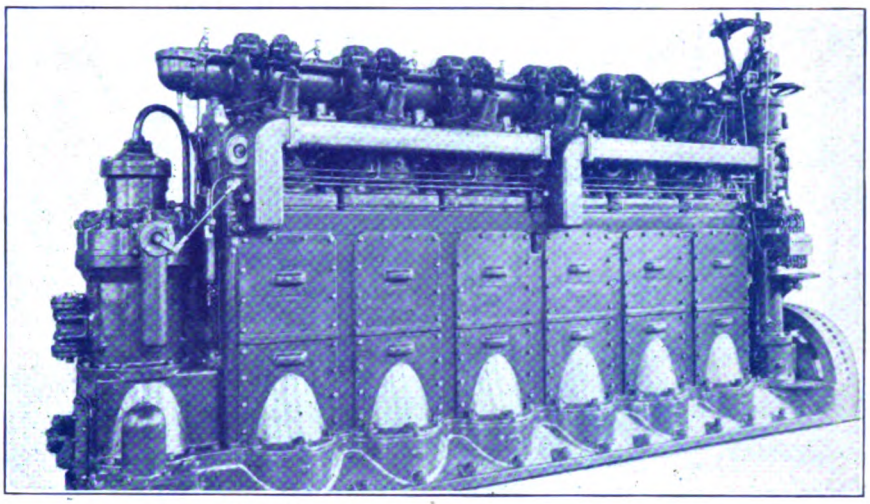
Diesel Direct Drive in Tug Russell 3

One Engine—375 B. H. P.



DESCRIPTION

One engine of this size and type, direct connected to the propeller shaft was installed in the tug, RUSSELL 3, owned and operated by the Newtown Creek Towing Co., New York City. This engine is of the four-cycle single-acting type. The power cylinders are of improved form and the whole engine is unusually convenient in arrangement.

Engine

Name of Engine—Lombard; Year—1923
Builder—The Lombard Governor Co.; **Cycle**—4
No. of Cylinders—Six; **I. H. P.**—480; **B. H. P.**—375
Action—Single; **Injection**—Air; **Scavenging**—None
Piston Clg.—None; **Bore**—13 in.; **Stroke**—19½ in.
R. P. M.—250; **Piston Speed**—812½ ft. p. m.
Pressure Ind.—98; **Pressure Brake**—76.5
I. H. P. per Cyl.—80; **B. H. P. per Cyl.**—62.5
Mech. Eff. Ind.—78%; **Mech. Eff. Measured**—82%
Stroke to Bore—1.5; **Working Strokes per Rev.**—3
Lgth. O. A.—22 ft. 11¾ in.; **Hght. O. A.**—10 ft. 2 in.
Width Over All—5 ft. 3 in.
Weight—One engine 64,370 lbs. including flywheel; All machinery, 75,000 lbs.; One engine, 172 lbs. per B. H. P.; 134 lbs. per I. H. P.
Reversing—Direct, air engine actuating camshaft.
Air Compressor—Three-stage attached; differential piston type with tube type intercoolers.

Vessel

Name—Russell 3; **Type**—Harbor towboat
Main Drive—Direct connected diesel
Length B. P. P.—77 ft. 9 in.; **Beam**—20 ft. 0 in.
Depth—9 ft. 6 in.; **Draft**—9 ft. 6 in.; **Speed**—10 kts.
No. of Propellers—One; **Fuel Capacity**—180 bbls.
Fuel Consumption—Lbs. per B. H. P. per hr.—0.42 Lbs. per I. H. P. per hr.—0.328; Radius without refueling, 4000 miles

This tug works 24 hours per day in New York harbor, shifting and towing. The owners also operate another diesel tug, the RUSSELL 2 which is powered with a 135 horsepower Lombard engine of similar type. It has been found through experience with these diesel tugs that their maneuvering ability and reliability is the equal of a steam tug with, of course, the additional advantage of greatly reduced cost of operation.

The cylinders are mounted in line upon the main frame in bored seatings and are held by steel tie-rods which transmit the working loads and relieve the frame and bedplate castings of tensile and bending stresses.

Engines of similar design are built by the Lombard company in sizes from 100 brake horsepower to 600 brake horsepower.

Diesel towboat RUSSEL 3—One 375 brake horsepower four cycle engine

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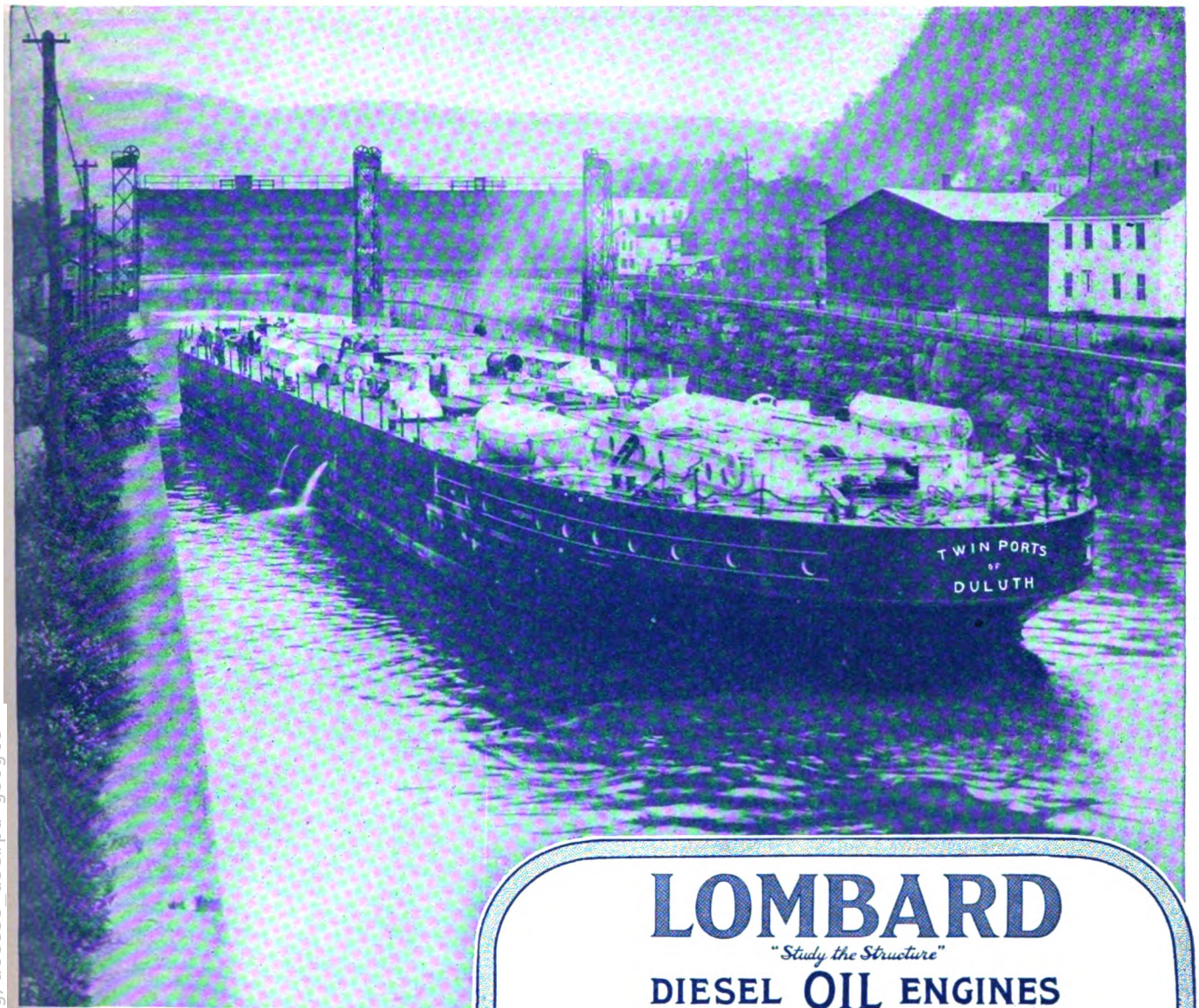

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—set a new standard of accessibility, save weight and headroom, and are notable for their practical simplicity and convenience.

The crank case is completely enclosed to retain and return for repeated use the lubricating oil of the pressure-stream circulating system. Yet — the whole front of the engine can be quickly opened up — climbing into crank case is unnecessary.

The cam shaft is mounted centrally on the cylinders to reduce the valve gear to simple rocker levers. Cylinder-and-head joint is eliminated to obtain unobstructed water circulation over cylinder top and around the valve ports. Yet — any piston can be withdrawn and with its connecting rod swung out through front of engine at great saving of time and without disturbing adjustments.

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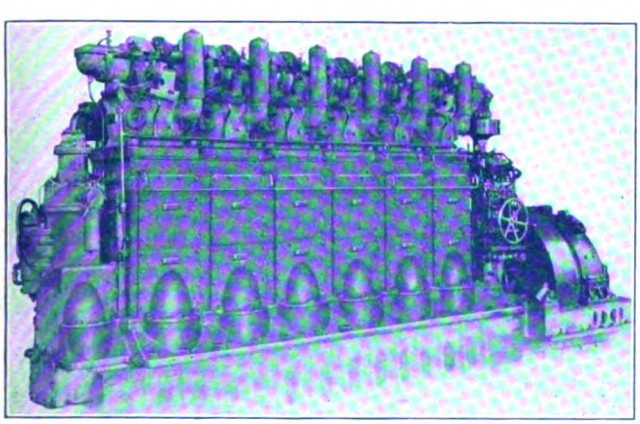
Established 1894

Diesel Engines and Water Power Governors

660 MAIN STREET, ASHLAND, MASS.



One of the 250 KW Electric Drive Sets of The McDougall Terminal Warehouse Company's "Twin Ports" and "Twin Cities"

The Lombard design pleases Owner and Operator

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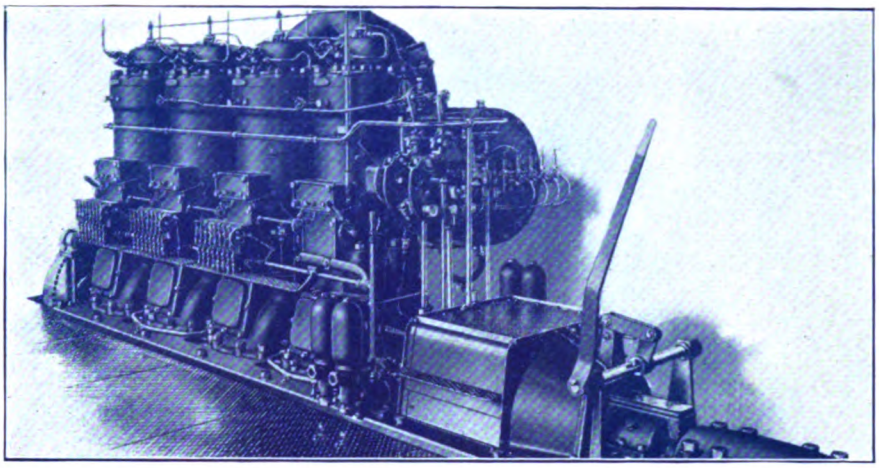
Oil Engine Direct Drive in Yacht Winona

One Engine—120 B. H. P.



DESCRIPTION

One engine of this size and type was installed in the yacht WINONA. The engine operates on the two-stroke cycle with solid injection. Electric ignition is used only in starting. The high temperature in the ignition bulb gasifies the injected fuel oil which with the compressed air in the cylinder forms an explosive mixture and ignites.

Engine

Name of Engine—Bolinder; Year 1925
Builder—J. & C. G. Bolinders Co., Ltd.
American Distributors—Bolinders Co. Inc.
Cycle—Two; **No. of Cylinders**—4; **B. H. P.**—120
Action—Single; **Injection**—Solid
Scavenging—Crankcase; **Piston Cooling**—None
Bore—9 7/16 in.; **Stroke**—9 13/16 in.; **R. P. M.**—475
Pressure Indicated—42.5; **Pressure Brake**—35
B. H. P. per Cyl.—30; **Mechanical Eff.**—75%
Stroke to Bore—1.04; **Wkg. Strokes per Rev.**—4
Lgth. O. A.—11 ft. 2 in.; **Hght. O. A.**—5 ft. 11/16 in.
Width Over All—3 ft. 4¾ in.
Weight—One engine, 9600 lbs; One engine, 80 lbs. per B. H. P.
Reversing—Direct reversible (pre-ignition)
Air Compressor—None (auxiliary)
Starting—Electric ignition device

Vessel

Name—Winona, ex Maraya, ex Bostonian
Type—Full powered yacht (wood)
Main Drive—Direct marine oil engine
Length— B. P. P.—89 ft.; **Beam**—13 ft. 6 in.
Draft—4 ft. 6 in.; **Speed**—10 knots
No. of Propellers—One
Fuel Consumption—Lbs. per B. H. P. per hr.—0.60

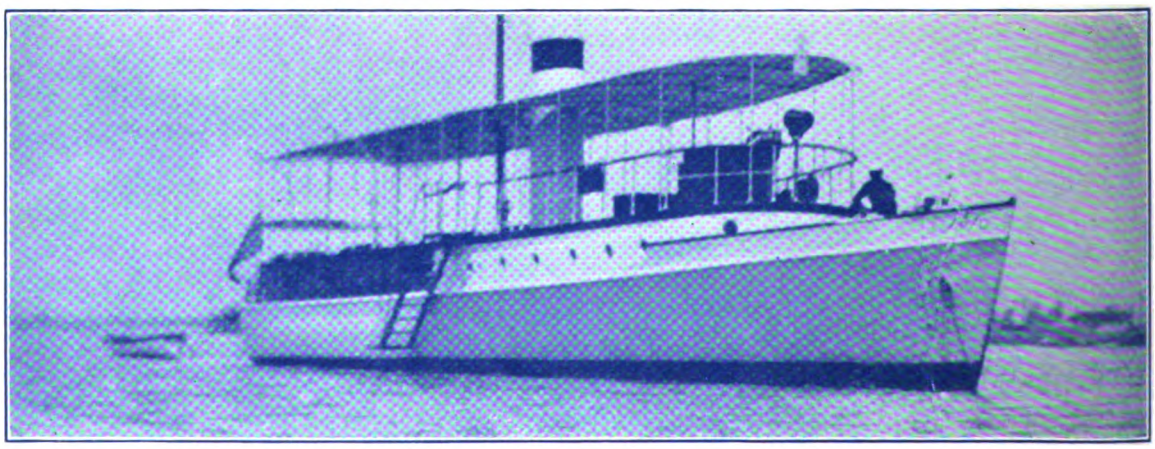
Remarks

The yacht WINONA was built in 1906 by the New York Yacht, Launch & Engine Co. and was originally equipped with a gasoline engine. This engine was removed and the 120 horsepower Bolinder engine described was installed in 1925.

The WINONA is used by A. C. Shumway of Lima, Peru, agent for the Ford Motor Co., in visiting the various ports on the coast of Peru where he maintains sales branches.

Some of the Larger Sizes of Engines Built

Type	B. H. P.	R. P. M.	Cycle	No. Cyls.	L. O. A.	Hght. above shaft	O. A. Width	Weight
B-25-M-40	180	400	2-cycle	4	14 ft. 6 in.	5 ft. 3 in.	4 ft. 1 7/16 in.	20,000
B-30-M-40	240	375	2-cycle	4	15 ft. 7¼ in.	5 ft. 7½ in.	4 ft. 5½ in.	23,500
B-40-M-40	300	300	2-cycle	4	17 ft. 6¾ in.	6 ft. 6¾ in.	5 ft. ½ in.	35,500
B-50-M-40	400	275	2-cycle	4	19 ft. 8¼ in.	7 ft. 4½ in.	6 ft. 5⅝ in.	47,500
B-60-M-40	600	200	2-cycle	4	24 ft. 5¼ in.	10 ft. 6 in.	8 ft. 10 1/16 in.	113,000



Yacht WINONA with one 120 brake horsepower Bolinder engine

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Engine parts—kept in stock at such widely scattered points as New York, New Orleans, Seattle and San Francisco—can instantly be dispatched, together with competent Bolinder engineering assistance, upon receipt of telegraphed requirements. The perfect Bolinder workmanship ensures absolute interchangeability of all parts. Our New York service department is illustrated above.

Sizes range from 6 to 600 H.P.

BOLINDER'S COMPANY, INC. 33 Rector Street NEW YORK

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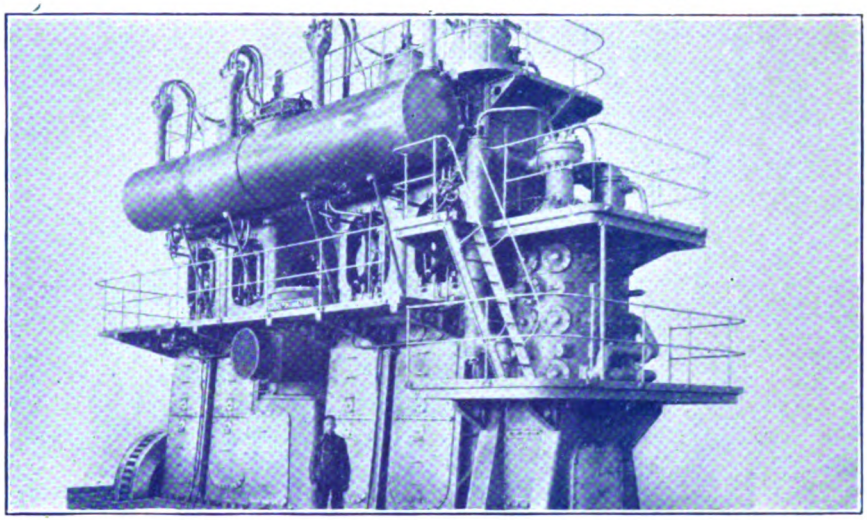
Diesel Direct Drive in M. S. Tampa

One Engine—2900 B. H. P.



DESCRIPTION

One engine of this size and type, direct connected to the propeller is being installed in the shipping board freighter TAMPA. This engine is the first of double acting type built in America and is of all American design. It is a two-cycle, slow speed heavy duty, crosshead type, air injection and double-acting diesel engine.

Engine

Name of Engine—Worthington; Year—1925
Builder—Worthington Pump & Machinery Corp.
Cycle—Two; **No. of Cylinders**—4; **B. H. P.**—2900
Action—Double acting; **Injection**—Air
Scavenning—Port; **Piston Cooling**—Fresh water
Bore—28 in.; **Stroke**—40 in.; **R. P. M.**—95
Piston Speed—633.3 ft. p. m.; **Pressure Brake**—64
B. H. P. per Cyl.—725; **Stroke to Bore**—1.43
Wkg. Strokes per Rev.—8; **Lgth. O. A.**—34 ft. 6 in.
Hght. to C. L.—26 ft. 7½ in.; **Width at Base**—11 ft.
Weight—One engine, 618,000 lbs.; One engine, 213 lbs. per B. H. P.
Reversing—Direct reversing
Air Comp.—Attached, scavenging and injection

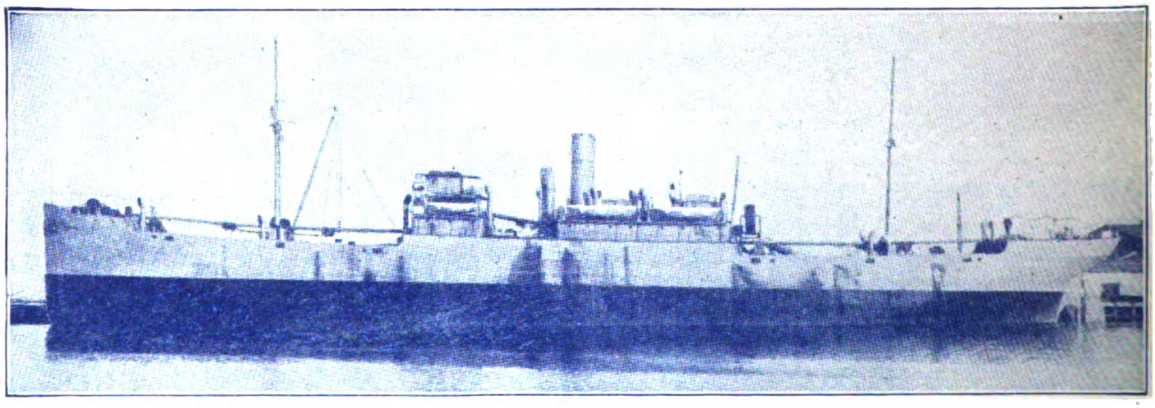
Vessel

Name—Tampa; **Owner**—United States S. B.
Conversion to Diesel—At Newport News S. B. & D. D. Co.
Type—Single screw, ocean cargo vessel
Main Drive—Direct connected diesel engine
Length B. P. P.—402 ft.; **Beam**—54 ft.
Depth—33 ft. 9 in.; **Draft**—26 ft. 10¾ in. (summer)
Displcmt.—12,910 tons; **Ddwght.**—Abt. 9400 tons
Speed—11½ knots; **No. of Propellers**—One
Fuel Consumption—From official log of 30-day test, Lbs. per B. H. P. per hr.—0.462
Generators—Three, auxiliary direct connected to Worthington diesel engines 265 R. P. M.

This engine is now being installed in the freighter TAMPA, known as the Oscar Daniels type, by the Newport News Shipbuilding & Dry Dock Co. and is one of the units of the shipping board's program of converting 14 steam vessels to diesel drive.

The engine is totally enclosed and it is provided with circulating pressure lubrication of all important parts. All parts exposed to high temperatures such as the cylinders and piston heads are of forged alloy steel.

Other standard sizes of engines built range from 50 to 540 B. H. P. single acting, two-cycle solid injection; from 300 to 800 B. H. P. single acting, four-cycle, air injection; from 500 to 12,000 B. H. P. double acting, two-cycle, air injection.



Tampa class—Single screw—One 2900 brake horsepower engine direct connected

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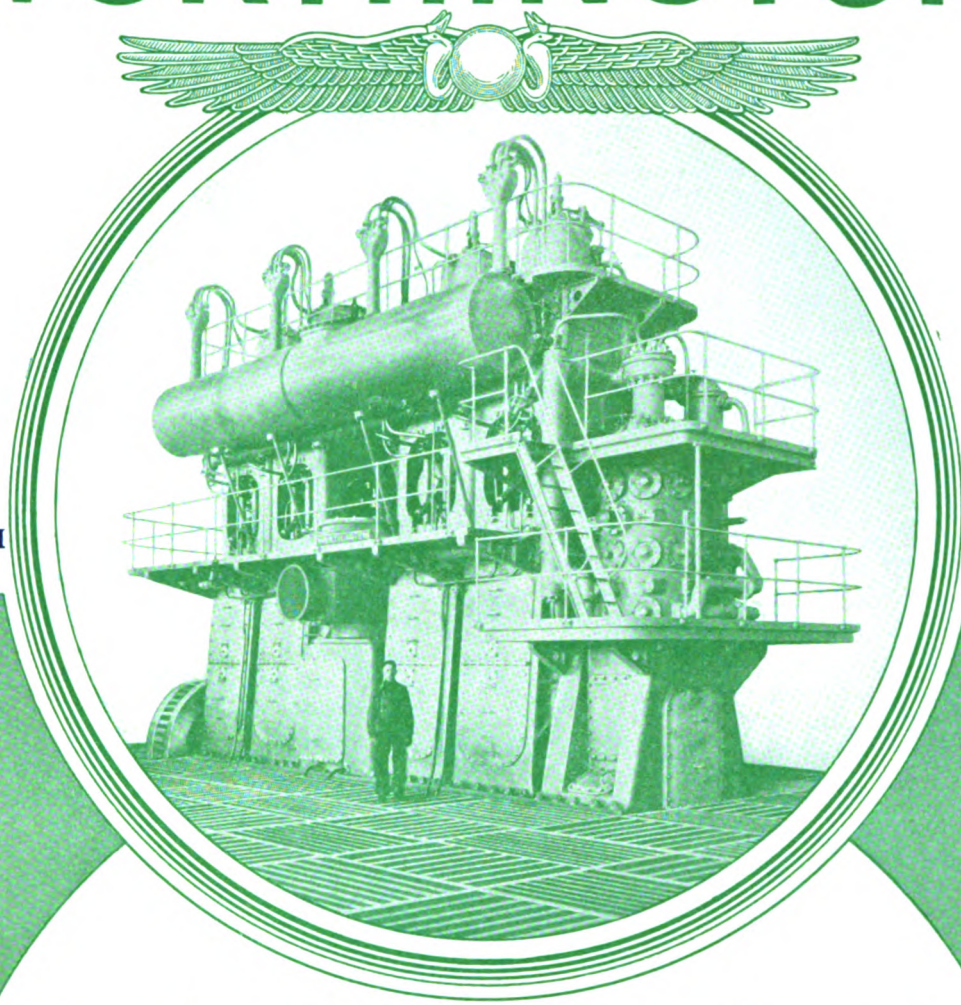
WORTHINGTON

for M. S. UNICOI



for M. S. TAMPA

Two big Worthington Diesels

soon to go to sea---*watch their performance*

HAVING shown complete dependability during exacting test runs under government supervision, the two 2900 hp. Diesels built by Worthington for the Shipping Board will soon be installed as main engines in the Shipping Board M.S. Unicoi and Tampa.

No vessels afloat will have more modern or economical power plants. The Worthington double-acting two-cycle Diesel is all-American in design and construction—and performance under test indicated that it is a more advanced engine than any built abroad.

During the official 30-day continuous endurance trial the engine was run at full load of 2900 hp. and speed of 96 r.p.m.; then without relief of load or stopping, a six-hour overload run was ordered. Developing 3500 hp., it ran with the same sweet smoothness that characterized the entire test. Then, after standing idle for 16½ hours, the big fellow was restarted from dead cold, without priming or any other adjustments, on the first throw of the starting lever. In maneuvering tests, fifty reversals were made in one hour, the average time from full speed in one direction to the first ignition in reverse direction being 8.55 seconds.

The test run was made on fuel oil of following average characteristics:

Gravity Baumé at 60°F . . . 20.19
(Some samples tested as low as 14° Baumé)
Flash point deg. F. 177
Burning point deg. F. 270
Viscosity Saybolt-Furol at 77°F. = 64 sec.

American marine history is rich in achievements—here is one in the making. If you wish to watch it closely we will send more data on request.

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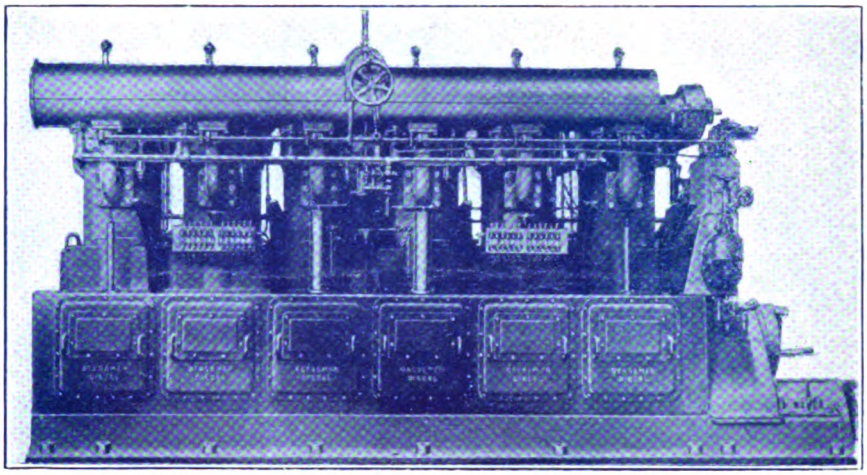
Diesel Direct Drive in Yacht Athero II

Two Engines—Each 800 B. H. P.



DESCRIPTION

Two engines of this size and type, each direct connected to separate propeller shaft, were installed in the yacht ATHERO II. The engines are of four stroke cycle, full diesel with solid injection of fuel oil. Crank shafts and connecting rods are of one-piece steel to the highest requirements of the American bureau and Lloyds.

Engine

Name of Engine—Bessemer; Year—1926
Builder—The Bessemer Gas Engine Co.
Cycle—Four; **No. of Cylinders**—6; **I. H. P.**—976
B. H. P.—800; **Action**—Single; **Injection**—Solid
Piston Cooling—Air; **Bore**—16 in.; **Stroke**—22 in.
R. P. M.—260; **Piston Speed**—953 ft. p. m.
Pressure Indicated—122; **Pressure Brake**—100
B. H. P. per Cyl.—133.3; **I. H. P. per Cyl.**—162.7
Mechanical Efficiency—82%; **Lgth. Engine**—25 ft.
Width—6 ft. 2 in.; **Height**—12 ft. 7 in.
Weight—102,000 lbs.; **Reversing**—Direct reversible
Air Comp.—Solid injection, no high pressure comp.

Vessel

Name—Athero II, designed by Henry J. Gielow Inc., built by George Lawley & Son Corp., for Jesse L. Livermore, New York.

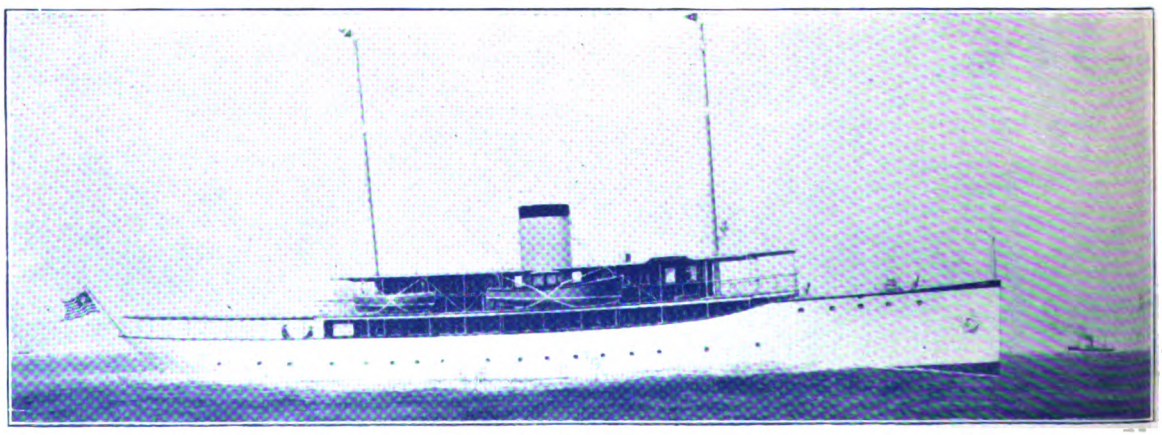
Type—Steel twin screw ocean going yacht
Main Drive—Diesel direct connected
Length—129 ft.; **Beam**—29 ft.; **Draft**—12 ft. 6 in.
Speed—15 knots; **No. of Propellers**—Two
Fuel Consumption—Lbs. per B. H. P. per hr.—0.42; Lbs. per I. H. P. per hr.—0.344
Generators—Two of 40 kilowatts each at 305 r. p. m. direct driven by two 60 horsepower Bessemer auxiliary engines.

The ATHERO II is one of the finest of America's newer yachts, especially seaworthy, and luxurious in its fittings.

The Bessemer diesel engines installed in this yacht are economical to operate, simple and rugged in design and dependable and quiet in operation. A perfected method of solid fuel oil injection gives maximum fuel economy and obviates the use of high pressure air compressor.

Some of the Larger Sizes of Engines Built

B. H. P.	R. P. M.	Cycle	No. Cyls.	L. O. A.	Width (Base)	Hght. O. A.
360	277	4-cycle	6	17 ft. 9 in.	4 ft. 0 in.	8 ft. 11 in.
420	257	4-cycle	6	20 ft. 2 in.	4 ft. 4½ in.	10 ft. 0 in.
670	225	4-cycle	6	25 ft. 8 in.	5 ft. 2 in.	10 ft. 2 in.
800	260	4-cycle	6	25 ft. 0 in.	6 ft. 2 in.	12 ft. 7 in.
1000	200	4-cycle	6	27 ft. 0 in.	6 ft. 3 in.	12 ft. 5 in.



Yacht ATHERO II—Twin screw—Two 800 brake horsepower engines each direct connected

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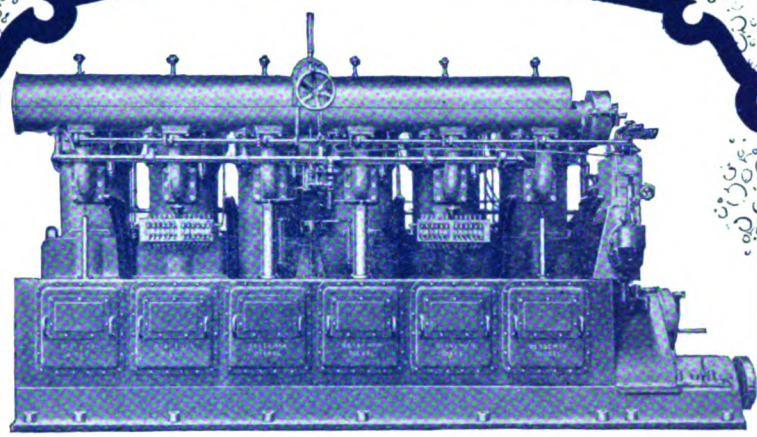

Better Materials Mean Better Service

THE materials that go into an engine determine the service that comes out of it. That is the reason that Bessemer Diesels deliver year after year of uninterrupted, trouble-free service. They are built for wear. Every part is the very finest that engineering skill has so far developed.

Bessemer crankshafts, for example, are of one piece steel, built to the formulas prescribed by the American Bureau of Shipping Grade II, and Lloyd's Grade B—the very finest grade of crankshaft metal that can be produced regardless of cost. Their connecting rods are also built of these same fine materials.

Like the crankshafts and connecting rods, every part that goes into a Bessemer Diesel is built to this same high standard. It is construction like this that insures the long, trouble-free service that only a Bessemer can deliver. That is why Bessemer Diesels are the ideal marine power plants, and are consistently being used in the newer and finer American built yachts, fish tugs and work boats.

Write for complete details and specifications of Bessemer Diesels.

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DIESEL ENGINES

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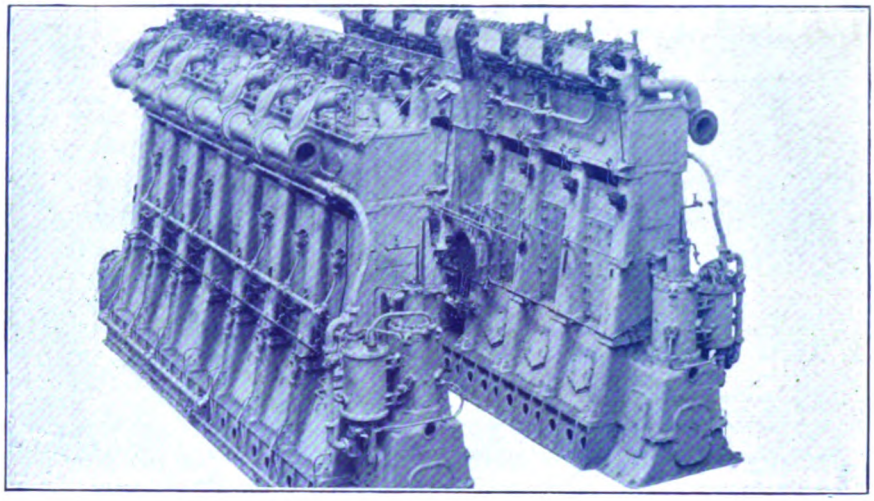
Diesel Direct Drive in Tanker Gulfcrest

Two Engines—Each 1535 B. H. P.



DESCRIPTION

Two engines of this size and type, direct connected to separate propellers, were installed in the tanker GULFCREST. These engines are of heavy duty, single acting, marine type direct reversing. The cylinder skirt is detachable for quick inspection or removal of main pistons. There is forced feed lubrication. The GULFCREST is owned by the Gulf Refining Co.

Engine

Name of Engine—A. B. B. Werkspoor; **Year**—1926
Builder—American Brown Boveri Electric Corp.
Cycle—Four; **No. of Cylinders**—6; **I. H. P.**—2000
B. H. P.—1535; **Action**—Sincle acting, marine type
Injection—Air; **Piston Coolg.**—Fresh or salt water
Bore—27 in.; **Stroke**—47 in.; **R. P. M.**—110
Piston Speed—860 ft. p. m.; **Press. Ind.**—90
Pressure Brake—68.4; **B. H. P. per Cyl.**—256
I. H. P. per Cyl.—333; **Mechanical Eff.**—76.7%
Stroke to Bore—1.74; **Wkg. Strokes per Rev.**—3
Length—39 ft. 4 in. (without flywheel)
Height—22 ft. 4 in. (to center of crank shaft)
Width Over All—10 ft. 3 in.
Weight—One engine, 582,400 lbs.; One engine, 375 lbs. per B. H. P.; One engine, 285 lbs. per I. H. P.
Reversing—Direct by ahead and astern cams
Air. Comp.—Three-stage, attached to engine

Vessel

Name—Gulfcrest; **Builder**—A. B. B. Electric Corp.
Type—Twin screw ocean going oil tanker
Main Drive—Two diesel engines direct connected
Length B. P. P.—460 ft.; **Beam**—65 ft.
Depth—38 ft.; **Draft**—28 ft. 4⅞ in.
Displacement—19,485 tons; **Ddwght.**—13,895 tons
Speed—11½ knots; **No. of Propellers**—Two
Fuel Capacity—6864 bbls., or 975 tons
Fuel Consumption—Lbs. per B. H. P. per hr.—0.394; Lbs. per I. H. P. per hr.—0.302; Tons per day—13.6; Sailing radius—21,000 miles
Generators—Two of 72 kilowatts each at 315 r. p. m.; Built by General Electric Co.; Direct diesel driven by Ingersoll-Rand engines

The motor tanker GULFCREST is engaged in regular service carrying oil and gasoline from Port Arthur, Texas, to Philadelphia, for her owners. To Oct. 15 she had run 30,000 miles.

Twin screw motor tanker GULFCREST—Two diesel engines, of 1535 brake horsepower each, direct connected

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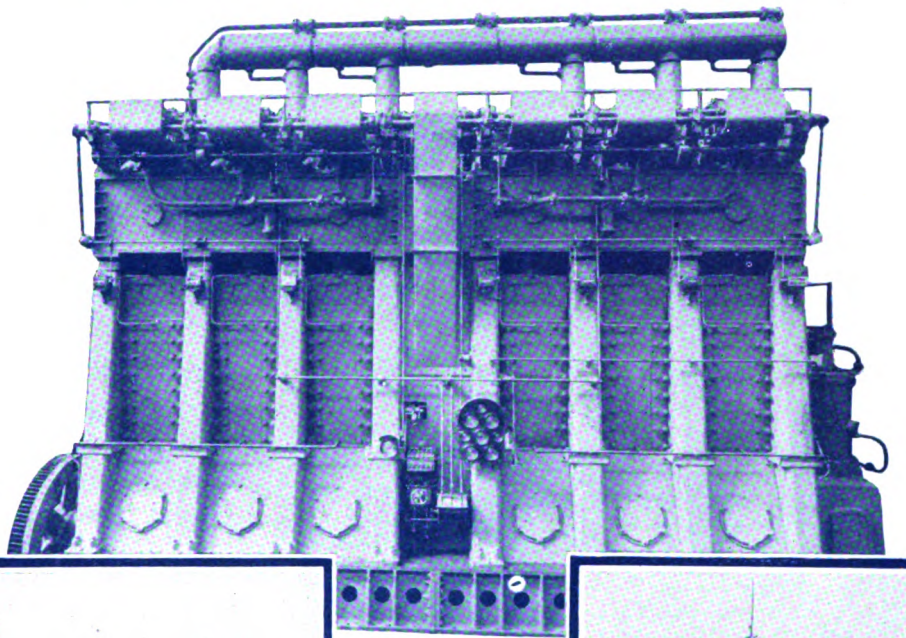
A.B.B.-WERKSPOOR

DIESEL ENGINES



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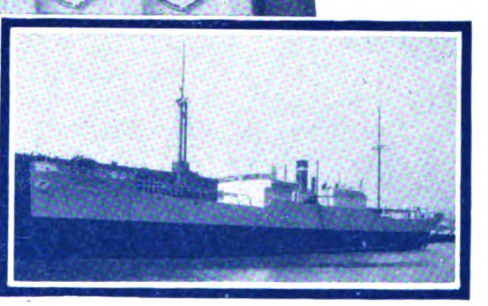

Steamship Conversions

—and for new motorships. Our 2000 I.H.P. Diesel engine illustrated is as installed in the converted Shipping Board vessels ASHBEE and JACKSONVILLE.

The "GULFCREST"—America's largest oiltanker—a twin-screw motor vessel of 13895 tons d. w. has to date covered —without stop—30,000 miles, averaged 11.4 knots per hour on 13.6 tons of fuel-oil per day for all purposes.

Our established record and experience in building all types of vessels offers a responsibility in such matters that should appeal to operators desiring any new tonnage of this nature.

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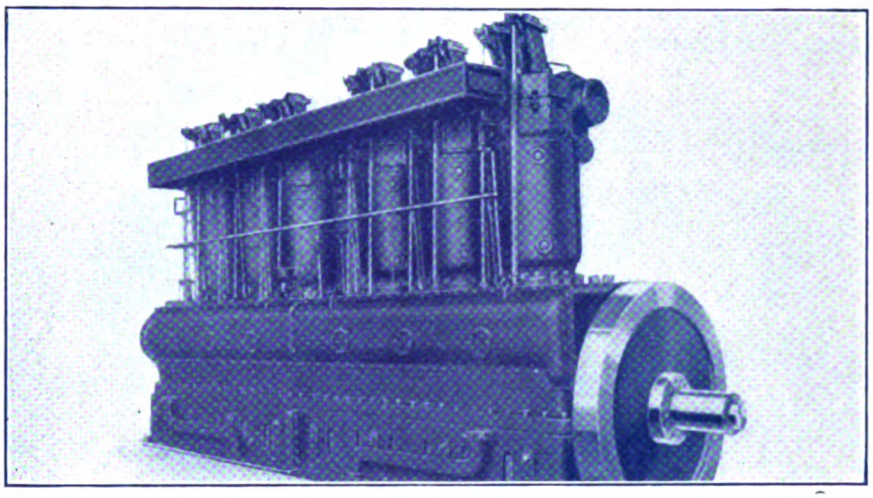
Diesel Electric Drive in Tanker J. W. Van Dyke

Three Engines—Each 840 B. H. P.



DESCRIPTION

Three engines of this size and type, each direct-connected to a generator, were installed in the tanker J. W. VAN DYKE. The engine is of single acting, trunk piston, direct-injection type and operates on the four-stroke cycle. It combines the simplicity of the so-called semi-diesel with fuel economy and cold starting features of the air injection diesel engine.

Engine

Name of Engine—Ingersoll-Rand, Type PR
Builder—Ingersoll-Rand Co.
Cycle—4; **No. of Cylinders**—6; **B. H. P.**—840
Action—Single; **Injection**—Direct
Piston Coolg.—Oil; **Bore**—19½ in.; **Stroke**—24 in.
R. P. M.—225; **Piston Speed**—900 ft. p. m.
Pressure Brake—69; **B. H. P. per Cyl.**—140
Stroke to Bore—1.23; **Wkg. Strokes per Rev.**—3
Lgth. O. A.—33 ft. 3 in., with generator and exciter
Height O. A.—13 ft. 6 in.; **Width**—6 ft. 10 in.
Weight—One engine, 160,000 lbs.; One engine, 190 lbs. per B. H. P.
Reversing—Non-reversing; electric drive
Air Comp.—Auxiliary for starting only

Vessel

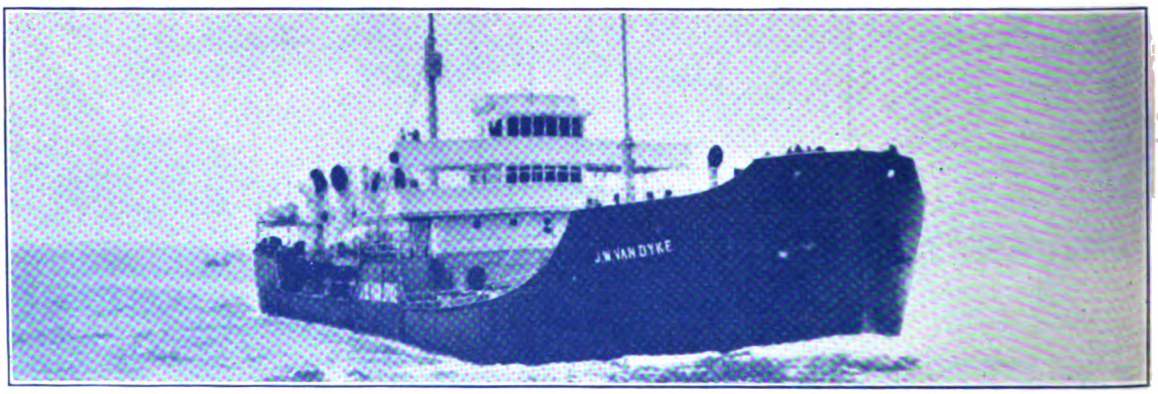
Name—J. W. Van Dyke; **Conversion**—Staten Island Shipbuilding & D. D. Co.
Type—Single screw ocean going tanker
Main Drive—Diesel-electric (motor)
Length B. P. P.—365 ft.; **Length O. A.**—380 ft.
Beam—50 ft. 9 in.; **Depth**—31 ft. 3 in.
Deadweight—7500 tons; **Speed**—11 knots
No. of Propellers—One; **Fuel Cap.**—7697 bbls.
Fuel Consumption—Lbs. per B. H. P. per hr.—0.40
Generators—Three of 600 kilowatts—250-volt each at 225 r. p. m. and with 50-kilowatt exciters attached; built by Westinghouse Electric & Mfg. Co.; each generator is driven by one oil engine of size and type illustrated and described above.
Electric Motor—One, 2300 s.h.p., 750-v., 100 r.p.m.

Remarks

The J. W. VAN DYKE before conversion to diesel-electric drive was the S. S. ALLENTOWN. Cargo carrying capacity was increased 5000 barrels by the conversion and it is now 60,000 barrels.

Over 100,000 miles has been logged by this tanker under direct pilot house control since May, 1925. Owned and operated by the Atlantic Refining Co., she has completed two voyages from Philadelphia to Rio de Janeiro and Durban, a distance of over 18,000 miles, without refueling on either voyage.

Several intercoastal trips between Philadelphia and San Pedro and coastwise trips to Port Arthur, Houston and other Gulf ports have been made.



Tanker J. W. VAN DYKE—Equipped with three diesel engine generating sets and one propulsion motor of 2300 H. P.

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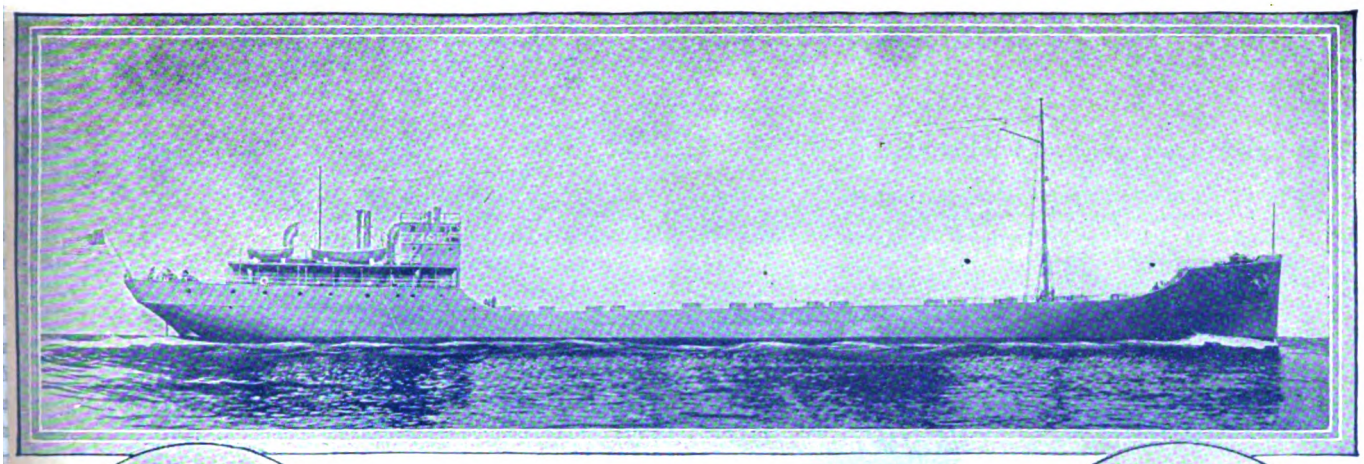
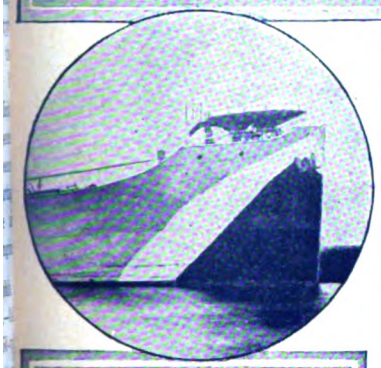
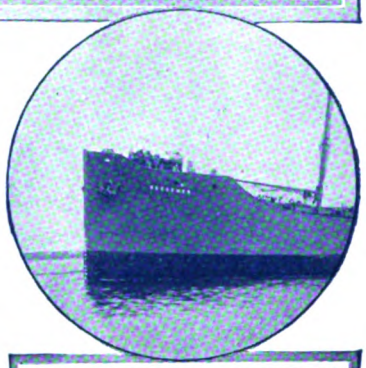






Modernize the Fleet with Oil-Electric Drive

THE successful operation of the Oil-Electric tanker "J. W. Van Dyke," formerly the "S.S. Allentown," has resulted in the sale of three more of the United States Shipping Board tankers from the "laid-up" fleet. These tankers, which were sold to the Atlantic Refining Company, will be converted to Oil-Electric drive

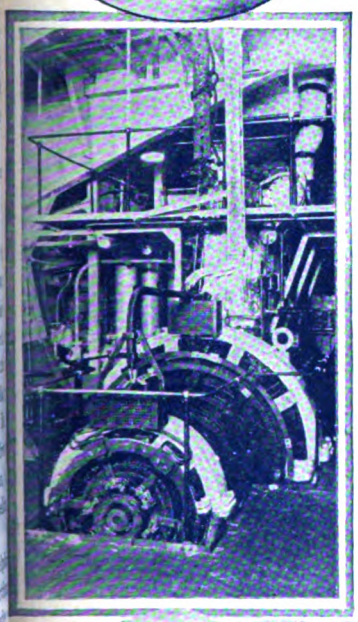
Ingersoll-Rand Oil Engines have again been selected for driving the main generators and exciters, and Ingersoll-Rand Oil Engines will be installed for driving the auxiliary generators.

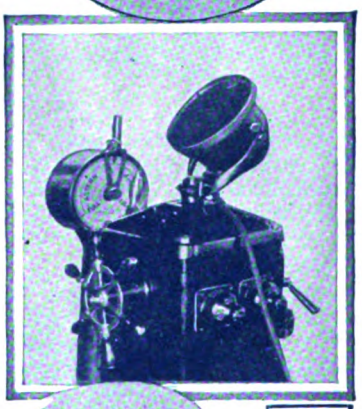
Oil-Electric drive, with its fuel economy, flexibility, pilot house control, and modern auxiliaries, provides the operating features needed to place more of the U. S. S. B's. idle ships in service.

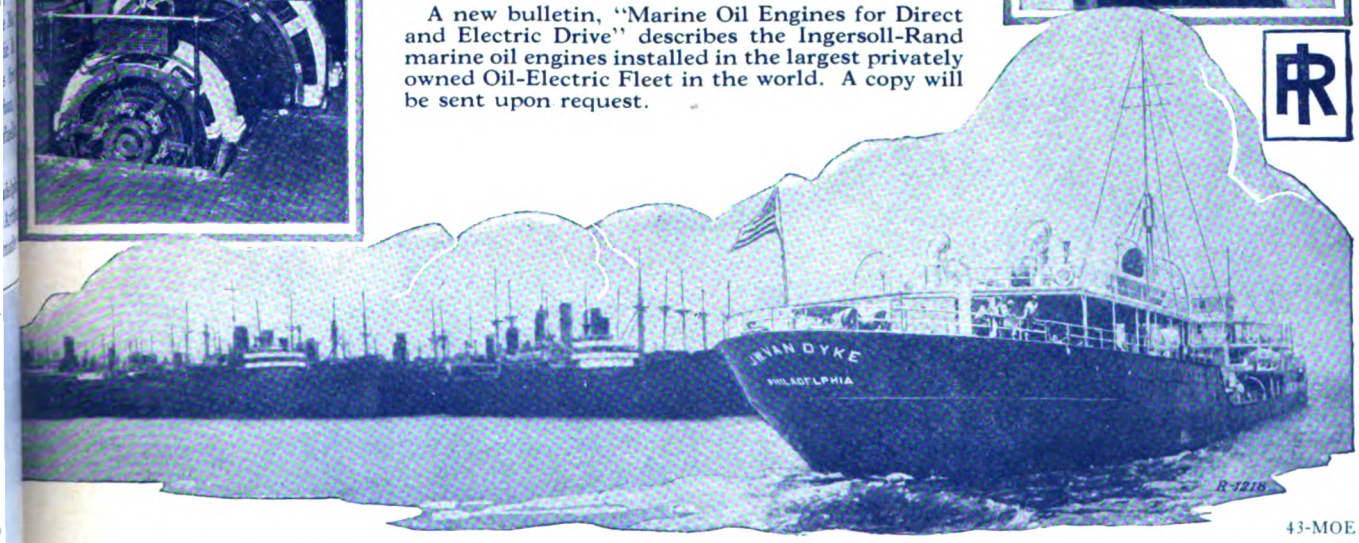
Passenger and cargo ships, freighters, and additional tankers can be modernized by the installation of Oil-Electric drive, a form of propulsion that is distinctly an American development.

The manipulation of Oil-Electric power provides the numerous combinations necessary to meet, economically and efficiently, all regular and emergency power requirements at sea, in the harbor, and at the dock.

A new bulletin, "Marine Oil Engines for Direct and Electric Drive" describes the Ingersoll-Rand marine oil engines installed in the largest privately owned Oil-Electric Fleet in the world. A copy will be sent upon request.







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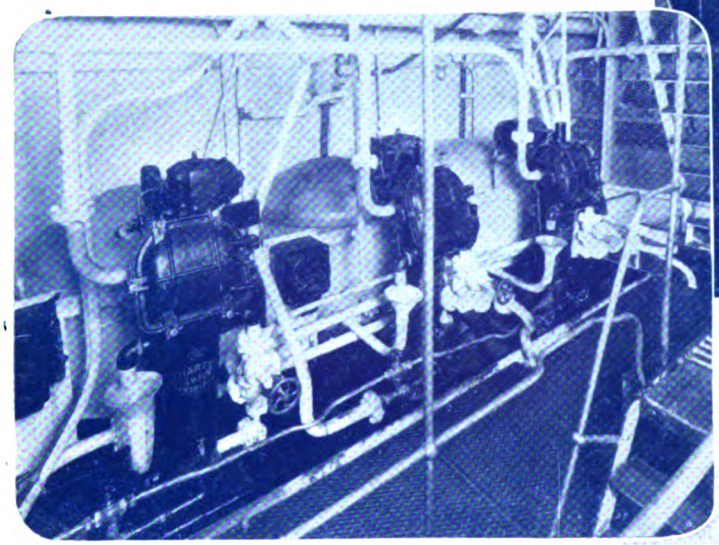
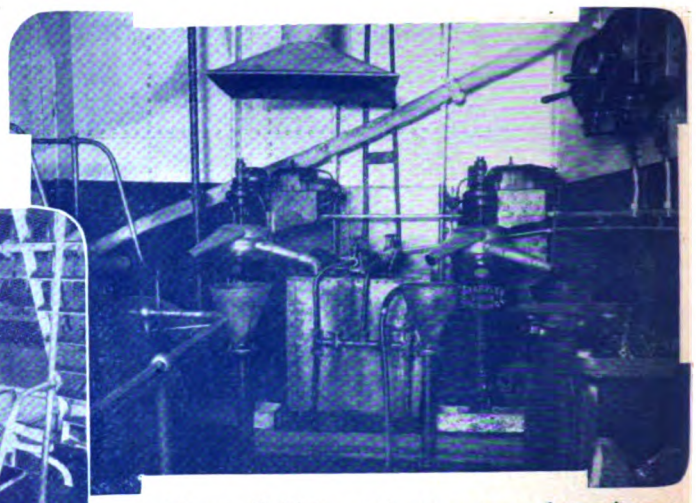
Diesel Ships Need Purifiers and Smaller Units

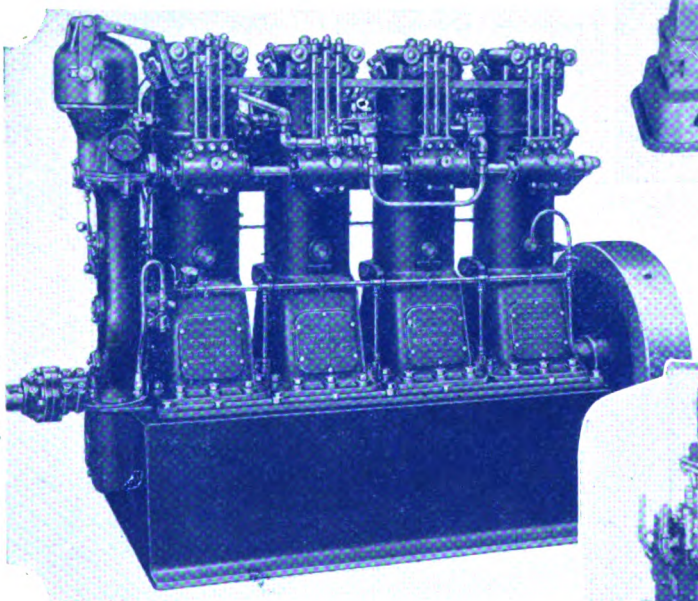
Below—Purification of lubricating oil on diesel ships is essential to guard against the serious effect of impurities on internal parts. Three No. 6 Sharples presurtite super centrifuges installed for the clarification of lubricating and diesel fuel oil on the M. S. Port Dunedin fitted with 5000-horsepower Doxford engines.

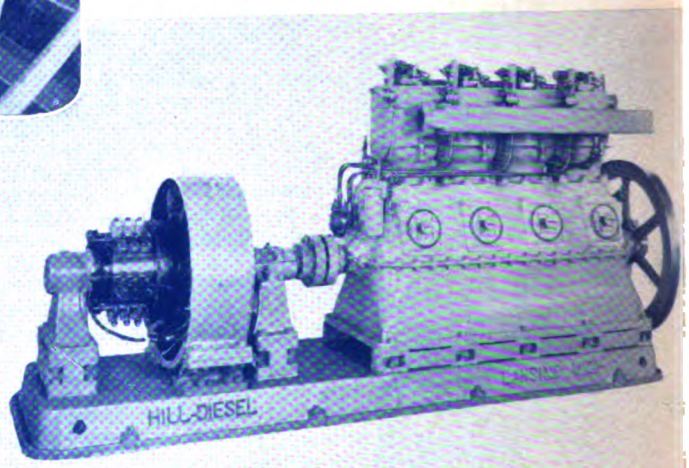




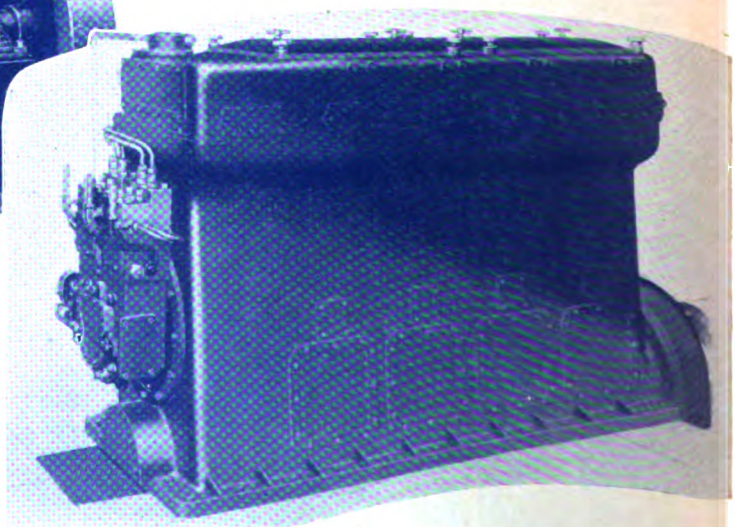
Above—British engineers appreciate importance of clean lubricating and fuel oil for diesel ships. Two No. 6 Sharples super centrifuges for clarifying fuel and lubricating oil on M. S. Pacific Shipper, fitted with 3000-H. P. engines

Below—A four-cycle airless injection oil engine, built by Cummins Engine Co., of 50 brake horsepower at 600 revolutions per minute. Suitable for generating or compressor sets.





Above—Hill diesel engine generating set installed on the M. S. Steel Electrician. A 25-horsepower engine direct connected to a 16-kilowatt direct current generator. Built by the Hill Diesel Engine Co.



At right—Completely enclosed four-cycle four-cylinder mechanical injection diesel engine built by the Foos Gas Engine Co. An installation of this type engine is now being made in a towboat. A six-cylinder engine is under construction for installation in a yacht. Sizes range from 75 to 475 brake horsepower at 350 to 900 revolutions per minute. Particularly suitable for generating sets.

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Utilizing

Diesel-developed Power

THE Diesel Engine, with its high thermal efficiency, ***develops*** power more economically than any other comparable device.

Electricity ***applies*** power more efficiently than any other agency.

The combination of Diesel economy and electric efficiency and flexibility is logical and practical. That is the reason for the growing trend toward Diesel-Electric propulsion.

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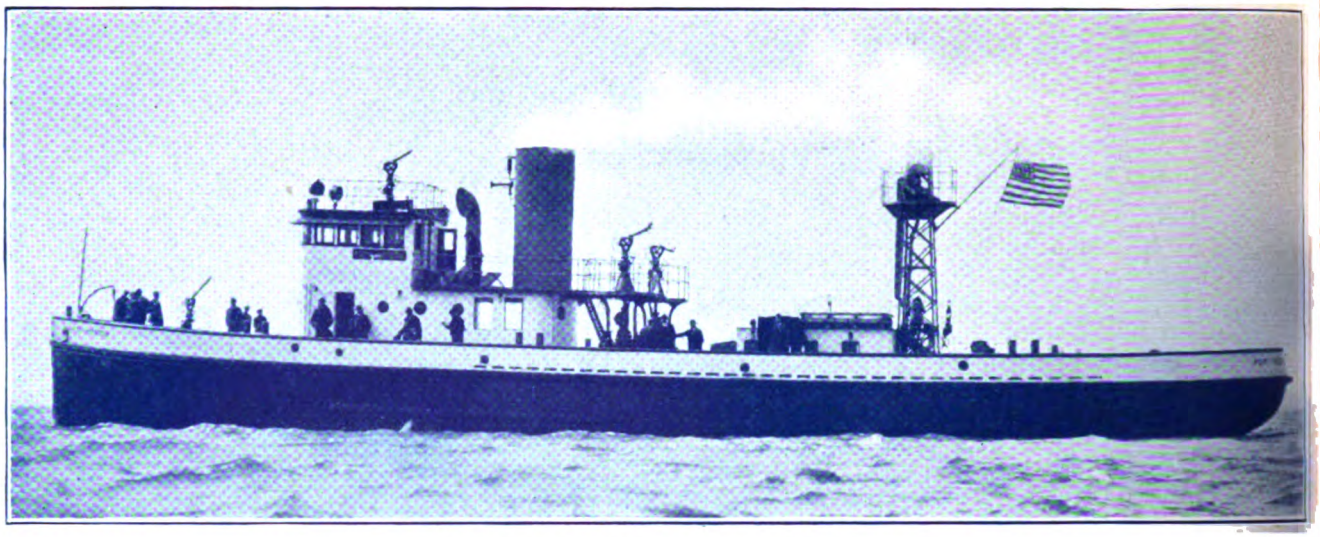

Fire boat PORT HOUSTON under moderate speed

Diesel-Electric Fire Boat Gives Economical Operation

BY W. E. THAU

THE PORT HOUSTON is a fire boat, 125 feet 10 inches in length overall; 27 feet, beam; and 8 feet, 6 inches, draft. The construction, of steel throughout, corresponds to the requirements of the classification societies. The boat was designed by the New York naval architects, Cox & Stevens, and constructed at the Harlan plant of the Bethlehem Shipbuilding Corp. Ltd. for the Harrison County Houston Ship Channel navigation district commission. Her propellers and fire pumps are supplied with power from the diesel electric voltage control system. The diesel engines were furnished by the Winton Engine Co. All the electrical equipment was supplied by the Westinghouse Electric & Mfg. Co., and the fire pumps by the Worthington Pump & Machinery Corp.

There is one main fire tower, and three additional fire stations, all fitted with fire nozzles. There are also hose connections at various positions along the rail, and at different heights, thus providing a very effective and flexible combination comprising a total of 39 outlets.

There are two main generating sets, each consisting of a 500-brake horsepower, six-cylinder, four-cycle, diesel engine, driving a 350-kilowatt, 425 revolutions per minute, 500-volt, main generator, to which is direct connected a 25-kilowatt, 125-volt exciter. There is also one auxiliary generating set consisting of a 165-brake horsepower, six-cylinder, four-cycle, diesel engine driving two 50-kilowatt, 270-volt generators at 425 revolutions per minute, and a 10-kilowatt, direct connected exciter.

IN THE accompanying article the entire question of cost, first and operating, is carefully analyzed for this type of craft. The results are amazing and show a tremendous advantage in favor of diesel-electric power. Under similar conditions of service and on the basis of this analysis it would be folly to adopt steam.

Each one of the twin propellers is driven by a 360-horsepower, 500-volt, 265 revolutions per minute motor. The two fire pumps are each direct connected to a 410-horsepower, 500-volt, 1750 revolutions per minute, shunt motor. The pumps are designed to deliver a total of 7000 gallons per minute at 150 pounds pressure when operating in parallel, and 3500 gallons per minute at 300 pounds pressure when operating in series.

In addition to the above, there is also one ten-kilowatt, alternating current to direct current, motor generator set for furnishing power from shore circuits when the fire boat is at its station; and a complement of engine room auxiliaries.

The propelling motors are controlled by the Westinghouse variable voltage control system from either one of two stations, one station located in the pilot house, and one in the engine room. When en route, the propelling motors are supplied with power from the two 350-kilowatt direct current generators, the arrangement being such that each generator supplies its own motor, thus permitting independent control of the propellers from full speed ahead to full speed astern. Twin propellers are used on this fire boat because of the very restricted waters in which it operates, which necessitates exacting maneuvering. Arrangements are made to connect either propelling motor from either of the main generators.

When fighting fire, the propeller motors are connected to the 50-kilowatt generators driven by the auxiliary generator. This set furnishes all the propelling power that is needed by the fire boat under fire-fighting conditions. The same flexibility of

The author, W. E. Thau, is manager, marine engineering, Westinghouse Electric & Mfg. Co. This article was prepared for MARINE REVIEW at the request of the editor. A paper on this subject was presented by D. H. Cox and the author before the American Association of Port Authorities at Norfolk, Va., Oct. 20, 1926.

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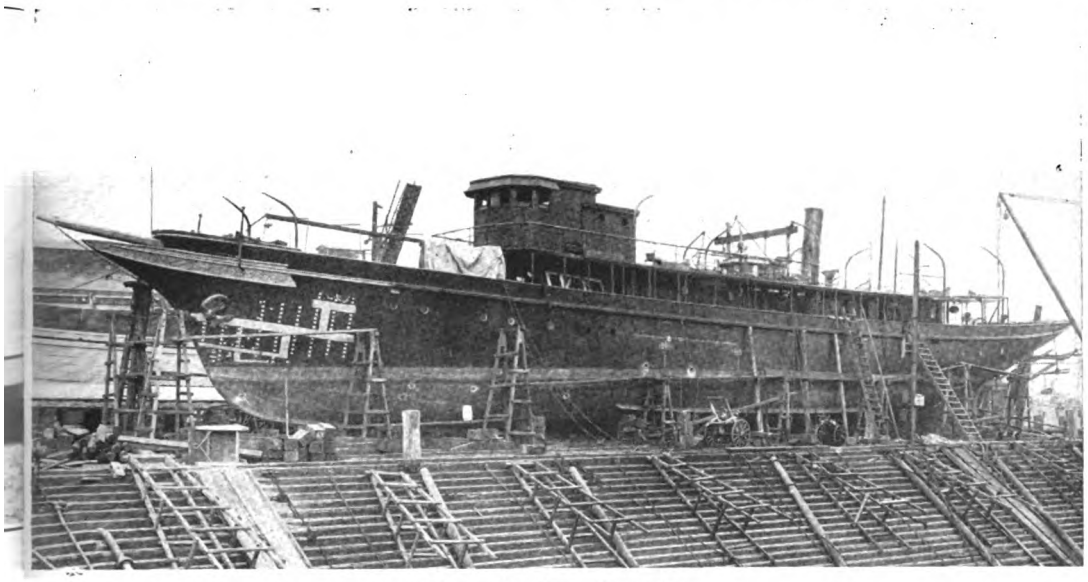

New pilot boat Carmina

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Judged by standards of economy, accuracy, efficiency or reliability, the experience of over sixty years makes A-E-CO Steerers the logical choice for ships of every size and type. Hundreds of installations, including some of the finest ships afloat, bear witness to the recognition which A-E-CO Steerers have won on a basis of proved performance.

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maneuvering is obtained as with the main sets.

Each fire pump motor is supplied with power from one of the main 350-kilowatt generators, and is controlled by the voltage control system, thus eliminating all rheostatic losses. An arrangement is introduced to permit operating either fire pump off either generator. The system of control permits the speed to be modified in small increments of change.

The PORT HOUSTON is the first fire boat to utilize the diesel electric system, and therefore it is of interest to study its characteristics and to point out its advantages. In order to better visualize these advantages, references will be made by way of comparison with a typical steam driven fire boat. The comparative figures which follow are taken from a typical steam driven fire boat, and reduced to the same operating capacities as obtain on the PORT HOUSTON.

First Cost: In studying the cost comparison, this discussion is limited to the machinery only. Insofar as the remainder of the boat is concerned the cost would be the same in either type. The cost of the machinery for the steam fire boat including turbine driven pumps, reciprocating engine single propeller drive, condensers, piping, boilers, and all engine room machinery is approximately $121,000. The cost of the complete diesel electric propulsion and pumping equipment together with all engine room auxiliaries on a directly comparable basis is approximately $136,000. Therefore, the machinery for the diesel electric fire boat costs approximately 12½ per cent more than that for the steam fire boat.

Weight: The total weight of machinery including bunker oil and water is 200 long tons in the case of the steam fire boat, and 140 long tons in the case of the diesel electric. It is, therefore, seen that the steam machinery weighs about 40 per cent more than the diesel electric machinery. This ratio will vary, depending upon the type of steam plant and the diesel engine speeds, however, the weight advantage should always be on the side of the diesel electric plant.

Readiness: The diesel electric fire boat is available on a moment's notice for full power, whereas in the case of the steam fire boat, even though the boilers are maintained at somewhere near full pressure, some time is required to get the boilers up to full capacity. The amount of time required varies with the type of boiler and the types of burners. Some steam installations can be gotten under full capacity at full pressure in a relatively short time; however, not as quickly as the diesel plant.

Crew: Regardless of the type of boilers, attendants are necessary to regulate the fires. In the case of the typical steam boat cited, the cost of this item is $14,000 a year. In the case of the diesel electric fire boat, the crew need be no larger than the crew of the steamboat minus the boiler attendants.

Fuel Cost: Since a fire boat operates very intermittently, and since direct comparative data is not available in the case of the two types of boats being considered, it is necessary to assume a certain cycle of operation in order to arrive at some idea of the fuel cost. For this purpose, it will be satisfactory to assume two conditions, one in which the fire boat operates 10 per cent of the time and is idle 90 per cent of the time; and the other in which the fire boat operates 20 per cent of the time and is idle 80 per cent of the time. In the case of the steam fire boat, it is necessary to keep the boiler pressure pretty close to normal and this entails stand-by losses. In the case of the diesel plant, the engines are idle when the boat is tied up at its station, it being neccessary to turn them over for only a few minutes each day.

Therefore, except for what little power is required for lighting and miscellaneous power, the diesel plant has no stand-by losses. A small auxiliary set will take care of the station power requirements. The following figures have been determined by calculation and in the case of the steam plant checked with figures obtained in service. In the case of the diesel plant, it is a simple matter to accurately determine the fuel consumption because of the known performance of diesel engines. On the above basis, the following are the yearly fuel costs:

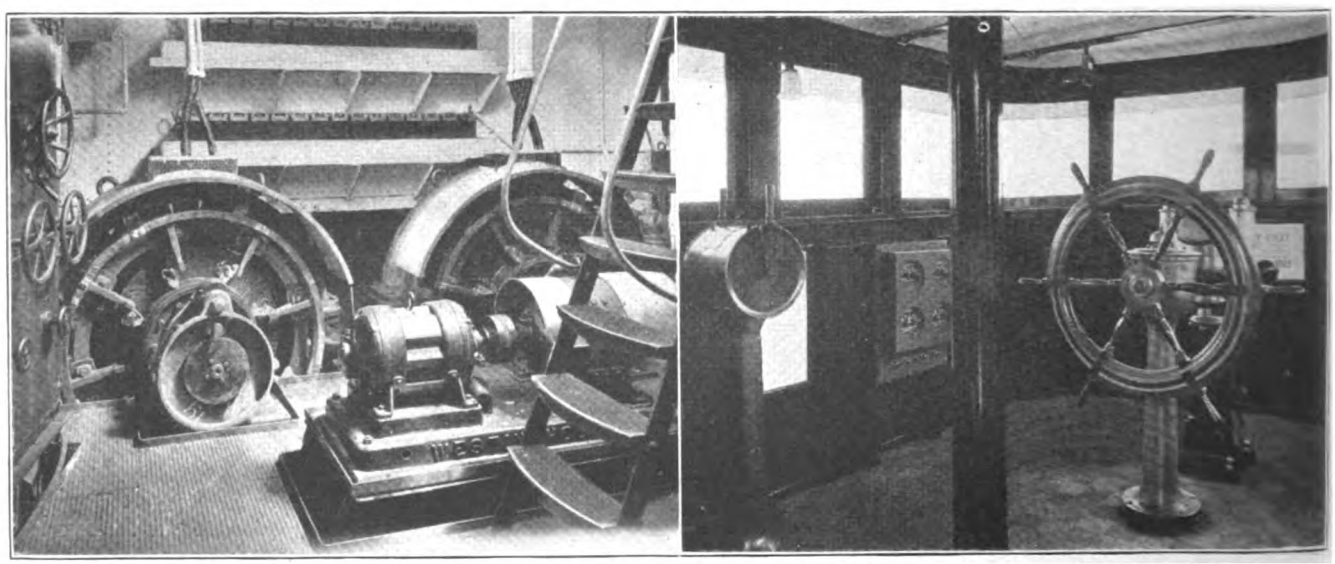
Working 10%	Idle 90%	Working 20%	Idle 80%
Steam	Diesel	Steam	Diesel
$9600	$3200	$15,000	$6400

In the above analysis, the power during the working period is taken at full load.

Operating Costs: Taking into account only those items which differ in the two types of fire boats, such as fuel, lubricating oil, crew difference, and machinery carrying charge (interest, depreciation, maintenance, insurance, etc., at 15 per cent), and disregarding those items which are the same in each case, the following figures are obtained:

Working 10%	Idle 90%	
Steam	Dies.-Elec.	Difference
$42,000	$24,000	$18,000
Working 20%	**Idle 80%**	
Steam	Dies.-Elec.	Difference
$47,000	$27,000	$20,000

An analysis of the above fig-



FIRE BOAT PORT HOUSTON—AT LEFT—TWIN SCREW PROPULSION MOTORS—THE MOTOR GENERATING SET IN THE FOREGROUND IS USED FOR CHARGING STORAGE BATTERIES—AT RIGHT—PILOT HOUSE. THE PILOT HAS DIRECT CONTROL OF SPEED AND DIRECTION OF ROTATION OF PROPELLING MOTORS

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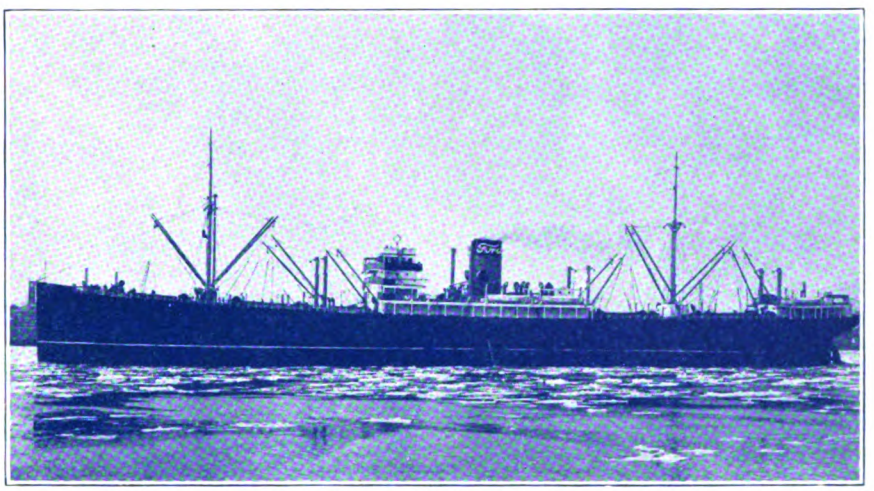

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The following American motor vessels and pleasure yachts are equipped with Brunswick-Kroeschell Refrigeration.

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The above list is more significant than many pages of print and illustrates the preponderance of Brunswick-Kroeschell equipment aboard ship.

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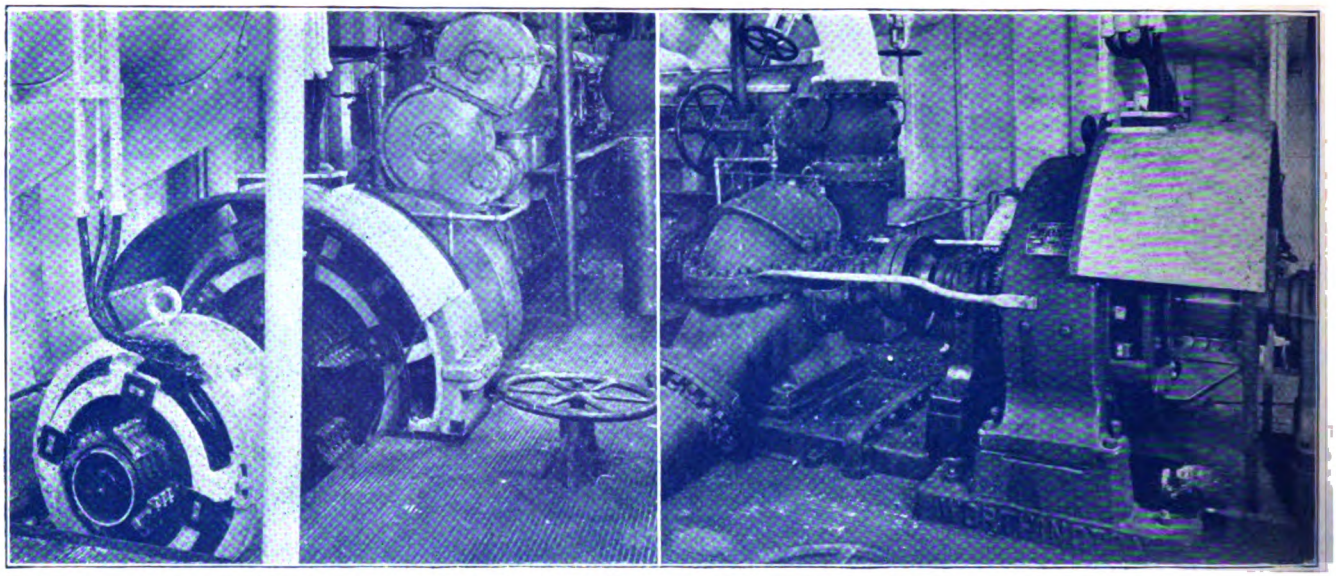
ures shows that on the basis of a 15 per cent carrying charge, the operating cost saving amounts to an equivalent investment of approximately $119,000 on the 10-90 basis, and approximately $134,000 on the 20-80 basis. The saving in operating costs shows a return on the additional investment for the diesel electric of 120 per cent on the 10-90 basis, and 134 per cent on the 20-80 basis, In other words, the equivalent capitalization at 15 per cent resulting from the yearly saving in operating costs is 8 times the difference in machinery costs. The item of additional crew cost in the case of the steam fire boat is alone more than sufficient to justify the additional expenditure.

Aside from the first cost and operating cost analysis which is very favorable to the diesel electric drive, the latter possesses very decided advantages in the way of readiness, control, weight, etc. The saving of even a few minutes in arriving at a fire may result in the prevention of considerable loss of property.

The conditions for the comparison made above have been taken conservatively, the steam fire boat being favored, if anything. The advantage clearly lies with the diesel-electric.



FIRE BOAT PORT HOUSTON—AT LEFT—MAIN GENERATING UNIT ON THE PORT SIDE. POWER CAN BE USED FOR PROPULSION, FIRE PUMPS OR AUXILIARIES—AT RIGHT—ONE OF THE MAIN FIRE PUMPS

Electric Deck Machinery Is Efficient

BY P. E. KRIEBEL

ELECTRIC or hydroelectric deck auxiliaries are the logical equipment for the dieselized motor ship. There are innumerable reasons, based not on theory alone but on actual experience and comparative data, why this is so. There is only one argument the manufacturer of this type of equipment must meet when comparison is made with steam, and that is the first cost. This is true of some classes of auxiliaries, but it applies only to the machines proper. In many instances, if considered thoroughly as an overall expense, the steam machines cost so much to install, with steam and exhaust piping, valves, condenser requirements etc., that the other types are cheaper.

Reliable manufacturers are striving to bring down costs by standardizing on parts for various types and have been able to make a favorable showing in the past few years where price is the main factor. This has been possible especially with the steering gear. The nature of the electrical requirements for winches and windlasses would seem to preclude much more reduction.

Economies Effected in Service

However, the main consideration should be the economies effected in service and reliability when called upon for instant action. These features should be given every consideration by the ship owner, operator and architect.

Figures demonstrating these economies are available, particularly in instances where steam ships have been converted to motor ships.

Aside from ordinary anchorage and warping in port, the windlass never is used except in emergency. That emergency may arise at any moment, hence steam must be on the line at all times. This is also a requirement where the pipe lines forward are on deck, in order to prevent freezing. This is a waste. The electric windlass takes power only when needed and in the interval is absoltely inert. When needed it jumps to the work without all the lost motions of draining cylinders etc.

Naval architects have realized this fact of late and have used the electric windlass even for turbine or other steamships of their design.

Shipbuilders state that it is cheaper to furnish and install electric windlasses than steam windlasses in spite of the expensive watertight electrical equipment required.

A notable example of the present trend toward the electric windlass is the action of Theodore Ferris, who has placed them on all his recently designed steamers, for the Clyde Steamship Co., and Clyde Miami, and who contemplates doing the same on the Red D. line.

Cargo hoists and capstans should be driven electrically. They are used only in port and the hoists are frequently awash when at sea. The elec-

The author, P. E. Kriebel, is a member of the staff of the American Engineering Co., Philadelphia.

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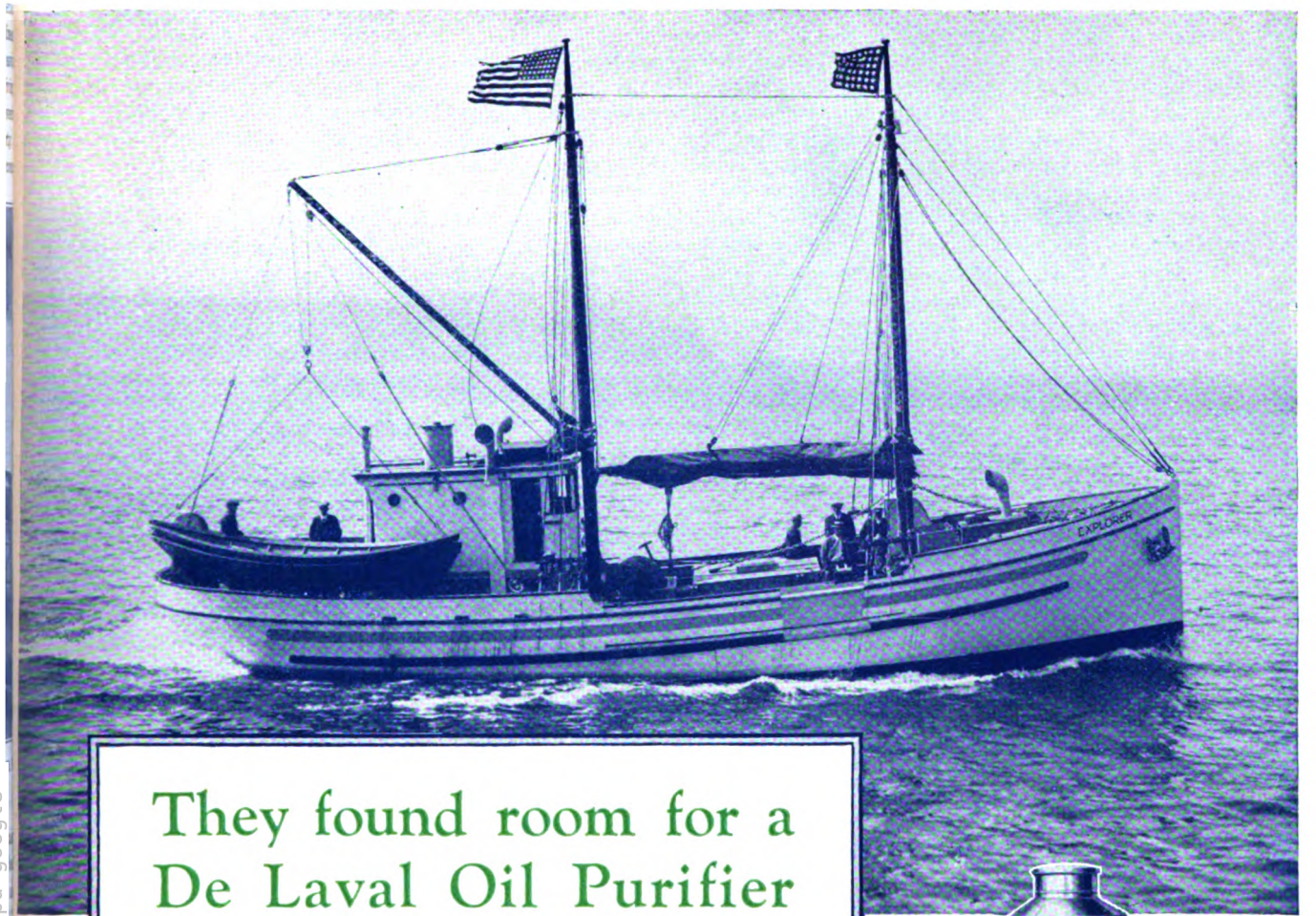

They found room for a De Laval Oil Purifier

MANY a Diesel-driven ship is wearing down her engine bearings and running up the cost for maintenance, adjustments and repairs, as well as wasting oil, because "there is no room for an oil purifier."

The Pacific Coast fishing companies have learned, however, that it pays handsomely to find room for a De Laval. These machines are now going on even the smallest vessels.

A recent example is the new halibut schooner *Explorer* built at Seattle for Magnus Hansen. This vessel is 65 ft. long with a 17½-ft. beam and 8-ft. depth, being powered with a 125-hp. Western-Enterprise Diesel engine. *Pacific Fisherman* says, "An interesting feature is the fact that the vessel is equipped with a (De Laval) oil purifier similar to those installed last year on salmon cannery tenders."

De Laval centrifugal purification is recognized by Diesel engine builders and operators alike as a sound form of engine insurance. They know that with the cleaner oil produced by a De Laval, wear is reduced to such a degree that bearings run months without adjustment where before they ran weeks. Moreover, sludge no longer accumulates in the oil grooves and channels of the engine and the necessity for disassembling the unit for manual cleaning of the oiling system is practically eliminated.

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trical manufacturers have brought their devices to such perfection for this service that, in spite of exposure and hard usage, they are ready for service at all times with no tuning up. Motors, solenoid brakes, controls, resistors and other parts are made submersion proof and impervious to salt air or water in their windings and terminals.

Not the least of the advantages of the electric hoist is the compound-wound motor's capacity for overload that makes these machines not only flexible in operation but capable of tackling jobs far beyond their rated capacities.

The cycle of hoisting, burtoning and lowering can be continued for many hours without undue heat rise and where there is dynamic braking, current is returned to the line when lowering.

The overload capacity on the capstan is just as valuable as on the hoist to meet extreme and unexpected conditions.

In any of these emergencies the steam machine would stall. This is a fact which cannot be lost sight of when comparisons of first costs are made. When steam machines are installed it often is necessary to purchase machines of greater rated capacity than when electric machines are used in order to obtain a margin of safety to meet the emergencies which electric machine would take care of as overloads.

The steering gear should be electric or electrohydraulic, the latter being more economical for several reasons. The fact that the stroke of the pump is adjustable to meet load conditions makes it possible to use a much smaller electric motor than would be required to do the work mechanically. The electric motor is started on leaving port and runs constantly during the entire voyage. There is no starting and stopping every time the wheel is moved, with high inrush of current, snapping contactors and solenoids.

Electric Steering Gears

The electrohydraulic steering gear has great flexibility as to the manner of installation and by making the rams opposed or duplex it can be built to suit the space available, almost without exception.

When it is not practicable to connect it to the rudder post the electrohydraulic steering gear can be located anywhere aboard ship by substituting sheaves for the tiller crosshead.

The motor is full shunt wound, running at constant speed under varying load conditions, the speed being the same as the efficiency revolutions per minute of the pump and the motor direct connected by a flexible coupling. In the cruising or "unsteady" angles but little power is used. When the wheel is at rest the motor is idling the pump on neutral stroke and consuming practically no power.

Electric auxiliaries on diesel ships dispense with the need for boilers, condensers, and pipe lines, and with the possible exception of hoists, can be run from the auxiliary generators.

Perfection in selective control, with any speed required from zero to a maximum, can be obtained by using the electrohydraulic drive on other auxiliaries besides the steering gear.

This advantage is being realized gradually and there already are some notable installations, the ALOHA, SIALIA and DAUNTLESS being three that stand out in the yacht class. The navy adopted it for the powerful capstans on the airplane carriers LEXINGTON and SARATOGA. It also has been in use by the navy for other purposes, especially turret turning, where nicety and precision of control are absolutely essential to correct gunfire.

The pumps and hydraulic motors used in this drive are very fine pieces of mechanism, built of the finest hardened materials and machined to an excellence that the service demands. This makes such devices somewhat more expensive, but there is no question as to their economical saving over any other drive.

Naval Architects Meet in New York Nov. 11-12

A PROGRAM of exceptional interest has been arranged for the thirty-fourth general meeting of the Society of Naval Architects and Marine Engineers which will be held in the Engineering Society's building, 20 West Thirty-ninth street, New York city, Thursday and Friday, Nov. 11 and 12, 1926. Thirteen technical papers will be presented at the professional sessions which will begin each day at 10:00 a. m. The council of the society will meet at 3:00 p. m., Nov. 10, in the board room of the Engineering Society's building. The banquet, following long established custom, will be held at 7:30 p. m. on Friday, Nov. 11, in the grand ballroom of the Waldorf-Astoria hotel. The titles of the papers, their authors, and the order in which they are to be delivered follows:

THURSDAY, NOV. 11, 1926

1. *"Maximum Block Coefficients and the Economic Disadvantage of Full Form"* by W. J. Lovett, visitor.

2. *"Naval Development of Floats for Aircraft"* by Commander H. C. Richardson, C. C., U. S. N., member.

3. *"Launch of the Airplane Carrier U. S. S. Lexington"* by S. W. Wakeman, member.

4. *"Analysis of the Standardization Trials of the U. S. Battleships Maryland, West Virginia, and Colorado,"* by Capt. William McEntee, C. C., U. S. N., council member.

5. *"An Investigation of the Behavior and of the Ultimate Strength of Riveted Joints Under Load,"* by Commander E. L. Gayhart, C. C., U. S. N., member.

6. *"Corrosion,"* by W. Bennet, member.

7. *"The Strength of Propeller Shaft Struts,"* by Lieut. W. P. Roop, C. C., U. S. N., visitor.

FRIDAY, NOV. 12, 1926

8. *"The Flettner Rudder,"* by Olav Overgaard, member, and J. Livingston, visitor.

9. *"Engineering Aids to Navigation,"* by Commander Stanford C. Hooper, U. S. N., visitor.

10. *"Considerations Governing the Selection of a Fleet for the Upper Mississippi River,"* by Brig. Gen. T. Q. Ashburn, U. S. A., visitor.

11. *"Performance Tests on Diesel-Electric Stern-Wheel Towboats,"* by C. H. Giroux, visitor.

12. *"Some Considerations in Design of Ferry Boats,"* by Prof. C. F. Gross, member, and Charles Green, visitor.

13. *"Diesel-Electric Propulsion,"* by W. E. Thau, member.

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Great Lakes Levels Are at Record Low Point

BY COL. SPENCER COSBY
Corps of Engineers, United States Army

DURING the past year or two the waters of the Great Lakes have receded to stages lower than even the oldest inhabitant could remember, and the causes, extent and effects of this lowering have been the subject of much discussion in our lake cities, not only by the shipping and riparian interests who were materially affected, but also by the man on the street. His interest in the matter has been twofold: on the one hand, he fears he may be indirectly disadvantaged, and on the other, the breaking of a record—whether it be by mere man or by Mother Nature—always arouses the curiosity of the American citizen.

In this case there can be no doubt that such record as we have has been broken in recent years for all the lakes except Ontario. The corps of engineers of the army, the government agency having charge of river and harbor improvements on the Great Lakes and their connecting waterways, has kept a careful and accurate record of changes in lake levels for the past 66 years. We have scattered records of levels prior to 1860, but little is known concerning the accuracy of these early figures. It is safest to confine this discussion of lake levels to the fairly wide range of 66 years regarding which we have reliable data.

At the time this is written the latest available reports are for the month of August, 1926. These show that the mean stage for that month for Lake Superior was 0.54 foot below the lowest August stage previously recorded—that of a year ago—while Lakes Michigan and Huron were 0.15 foot higher, and Lake Erie was 0.22 foot higher than their previously recorded August lows, which were in 1925. Lake Ontario, on the other hand, was 0.64 foot above its lowest August stage made in 1895. Just what these figures mean will perhaps be more clearly appreciated from the following table:

	Below average August stage of last 10 years	Below highest August stage ever recorded
Lake Superior	1.47 ft.	2.95 ft. (in 1876)
Lakes Michigan-Huron	1.96 ft.	4.92 ft. (in 1876)
Lake Erie	1.16 ft.	2.81 ft. (in 1876)
Lake Ontario	1.30 ft.	3.27 ft. (in 1862)

It will be observed that in all these cases comparison is made with the corresponding month (August) of other years. This is the fairest method since it eliminates the seasonal variation to which, as will be explained later, the levels of all the lakes are subject. However, to show the greatest recorded variations in monthly mean lake stages, the following table has been compiled:

	Highest recorded monthly mean stage
Lake Superior	Sept., 1869
Lake Michigan	June, 1886
Lake Huron	July, 1876
Lake Erie	June, 1876
Lake Ontario	May, 1870

	Lowest recorded monthly mean stage
Lake Superior	Apr., 1926
Lake Michigan	Jan., 1926
Lake Huron	Feb., 1926
Lake Erie	Feb., 1926
Lake Ontario	Nov., 1895

	Difference
Lake Superior	3.96 ft.
Lake Michigan	6.22 ft.
Lake Huron	6.30 ft.
Lake Erie	4.62 ft.
Lake Ontario	5.54 ft.

To prevent misunderstanding, it may be stated here that there have been many occasions on which the different lakes have, at particular localities, reached elevations several feet lower or higher than the monthly means, but these abnormal changes were for short periods only (often only a few hours) and were due to temporary causes, chiefly to strong winds blowing for some time in the same direction.

Causes of Change in Levels

It is manifest from what has already been stated that the levels of the Great Lakes are in a constant state of fluctuation, that some of the changes are gradual, some sudden, some amount to only a few inches and others to several feet. For changes of such varying character there must be varying causes. These may be conveniently divided into six general classes.

1. The first and most important cause is the amount of rainfall over the drainage basins of the Great Lakes, especially over that of Lake Superior, the largest of all (80,700 square miles) whose discharge directly affects the water surface of every other lake. It has been estimated that the average annual precipitation over the watershed of the lake system above Niagara Falls is about 30 inches, and that the net supply to the lakes, taking into account rainfall, run-off and evaporation, amounts to about 36 inches in depth over the lake surfaces.

The chain of Great Lakes are continuously discharging a huge stream of water over Niagara falls and down the St. Lawrence into the Atlantic. to conpensate for this loss rivers and streams innumerable are gathering and pouring into the lakes the water that falls as rain or snow on their watersheds. If this precipitation decreases and continues below normal for several successive years, the inflow will be less than the outflow and the levels of the lakes will fall more or less steadily during that period. This lowering will take place very gradually however as the water areas involved are enormous and the relation between them and the discharge capacities of their outlets is such as to make a fair degree of stability by natural regulation. From 1917 to 1926 there was a deficiency of rainfall over the whole drainage basin of the Great Lakes, and this is the primary and principal cause of the low levels during recent years.

The records show that a major rise or fall in lake levels due to precipitation changes usually continues, when once started, over a period of several years, but the duration of these periods or cycles is very irregular and the rise or fall is often subject to minor interruptions. Taking Lake Erie as an example and disregarding these minor interruptions there were, roughly, nine highs between 1860 and 1925, both years inclusive; the length of time from one high to the next varied from 4 years to 15 years. For Lake Huron during the same period there were also nine highs, the length of time from one high to the next varying from 5 years to 13 years.

2. A second cause of what may be termed lasting and general, as opposed to temporary and local, changes in lake levels is the amount of water

(*Continued on Page 76*)

The author, Colonel Cosby, is engineer in charge of the Great Lakes district.

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Electric Winches Are Reliable

Application of Diesel Drive a Factor in the Perfection of the Electric Winch—Early Difficulties Have Been Overcome

BY J. S. CARSWELL

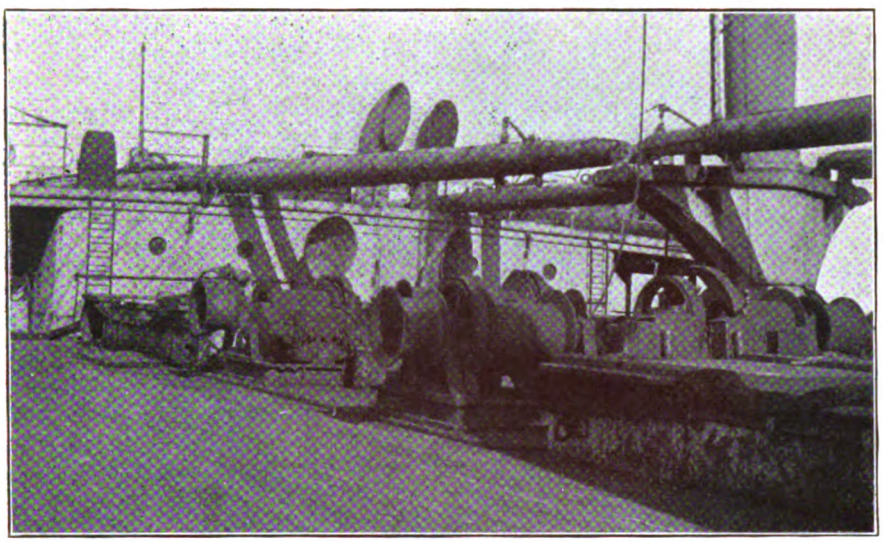

Fig. 1—S. S. MINNESOTA—The first large installation of electric cargo winches

THE successful development of the diesel engine for ship propulsion has made the development of the electric winch a necessity. Today the electric winch is generally accepted as a tried and successful product, but only five or six years ago, naval architects and shipping men attempted to avoid the use of electric winches on diesel ships, particularly on conversion jobs, as they considered the electric winch a doubtful experiment.

Usually they suggested running the regular steam winch from an auxiliary boiler or by compressed air. A boiler to heat the oil and furnish heat to the ship was necessary so why not make it a little larger and run the winches? The air compressors and storage tanks to maneuver the main engines were not used when the ship was in port; why not make them a little larger and run the winches on compressed air? Careful figuring soon showed that the boiler would have to be more than a little larger and would use too much fresh water unless condensers and other steam auxiliaries were installed for which there was not usually sufficient space. The average sized ship running 10 winches on compressed air, would require about 3000 cubic feet of free air per minute to handle cargo at average speed thus making the size of compressors and storage tanks too expensive and impractical.

So, the winch builder and the electrical manufacturer had to meet the problem and still the doubts of the skeptical. Their success is shown by the fact that many steam driven ships building today are installing electric winches. Unlike the diesel ship, the steamship is not forced to use the electric winch but does so because it has proven thoroughly efficient and reliable.

Development of Electric Winch

In spite of the first cost, usually over twice that of the steam winch, the electric winch soon pays for itself in the saving in fuel consumption particularly on ships making a quick turn around and spending a large percentage of time handling cargo in port. Some records show the port fuel consumption of a ship fitted with steam winches. Other advantages of the electric winch are, quieter and cleaner operation and the elimination of the hot, and sometimes leaky steam pipes from the hold with the ever present danger of damaged cargo, also the danger of freezing in cold weather.

The development of the electric winch dates back to 1904 when James J. Hill, with a vision far beyond his times built the MINNESOTA and NORTH DAKOTA, installed 37 Lidgerwood electric cargo winches on each vessel. These winches were clumsy and crude in control as compared with our present day winches but were in constant use on the MINNESOTA up to the time of her removal from service three or four years ago.

Following these installations, some electric winches were installed, particularly on navy and other government ships but little progress was made in using them on merchant ships of this country until the war period. Somewhat more progress was made on foreign ships but the foreign built electric winches appeared heavy and very slow and could not compare in cargo handling capacity to the steam winch.

In 1918 the ABRAHAM LINCOLN and three sister ships were fitted with electric winches using alternating current. They have a practically constant speed regardless of whether

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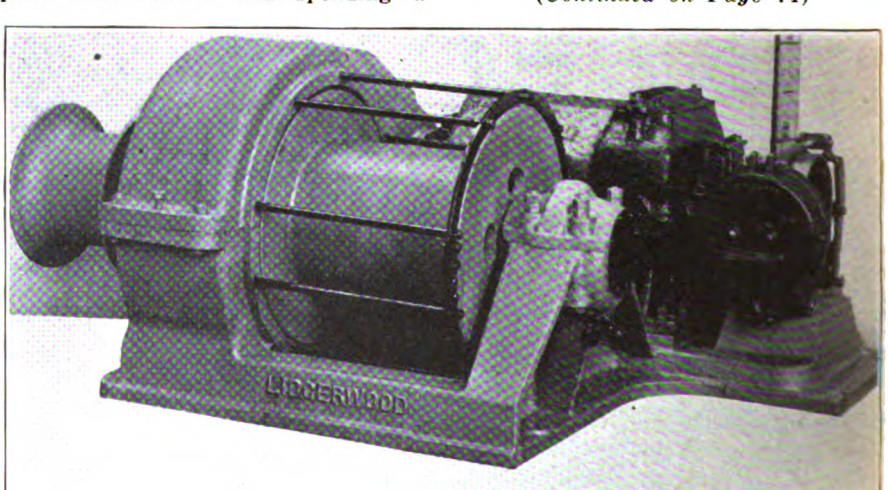

FIG. 2—ELECTRIC CARGO WINCH SPECIALLY DEVELOPED AND DESIGNED FOR THE 14 VESSELS OF THE SHIPPING BOARD'S DIESEL CONVERSION PROGRAM

The author, J. S. Carswell, is sales engineer of the Lidgerwood Mfg. Co., 96 Liberty street, New York.

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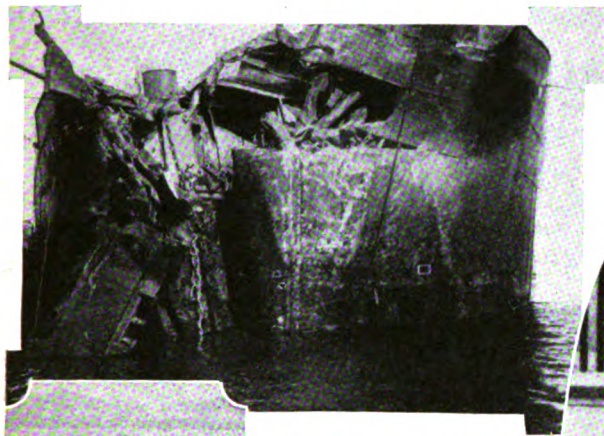
Latest Marine News in Pictures

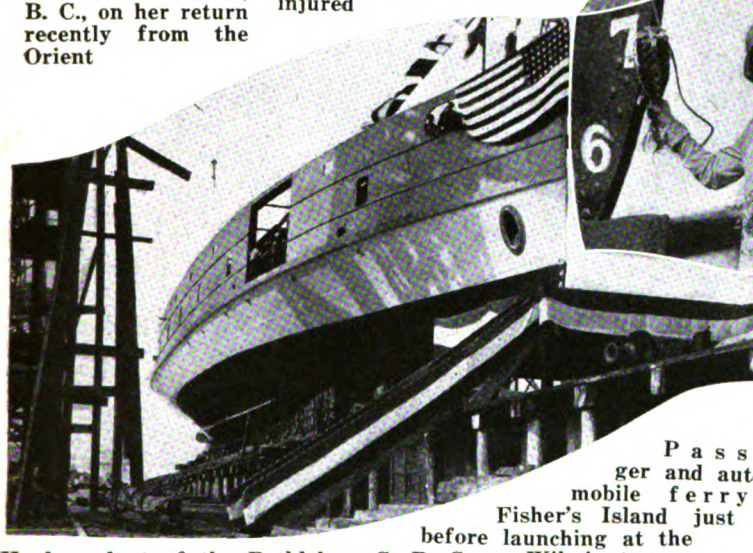


Alfred Bird, 16-year old youth of Somerville, Mass., displaying several beautiful ship models which he has made with his jackknife as his only tool. He is shown holding a model of the famous Flying Cloud. So remarkable is his work that he has been offered a scholarship in the course in naval architecture at the Massachusetts Institute of Technology

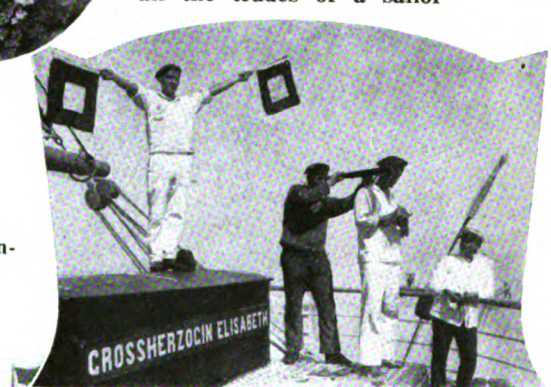
Empress of Russia at Vancouver, B. C., on her return recently from the Orient

British steamer Westlea at New Castle after collision with steamer Dosina in a fog, 25 miles off Portland. Though badly damaged none of the crew was injured

Training German sailors on the Grand Duchess Elizabeth. Taught all the trades of a sailor



Passenger and automobile ferry Fisher's Island just before launching at the Harlan plant of the Bethlehem S. B. Corp., Wilmington, July 22. In inset Miss Carroll H. Ferguson, sponsor



Mrs. Nellie D. Raymond sponsor of the Clyde liner Algonquin at Newport News Sept. 9

S. S. Roma, arriving in New York. Italy's largest and fastest ship she is 710 feet long and 64 feet wide. Her maiden voyage from Genoa took eight days

Left to right W. R. Sanders, S. W. Hamilton, F. J. Murphy and J. F. Curran, government officials from New York on a visit to the Malolo at Cramps

Marine City on the St. Clair river with modern lake freighter passing. Over 90,000,000 tons of cargo passes this point annually

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Personal Sketches of Marine Men

Franklin D. Mooney, President Atlantic Gulf & W. I. Steamship Lines

By E. C. Kreutzberg

HIS entire career has been devoted with remarkable singleness of purpose to shipping and allied business interests.

A HARD and thorough worker himself he expects efficiency and application to the job in hand on the part of all his associates.

HE RECEIVES ungrudgingly and in full measure the loyalty and active support of his colleagues due to his marked characteristics of patience, tact and recognition of the work of others.

FRANKLIN D. MOONEY has earned distinction as a member of the group of outstanding steamship company executives who displayed marked ability to weather the terrific depression which hit the shipping industry very hard after the war, and who have been able to adjust themselves to the present exacting conditions in that business. He was elected president of the Atlantic, Gulf & West Indies Steamship Lines in 1921, when the shipping industry was entering the blackest period within the memory of the present generation. Succeeding A. R. Nicol, whose health had given way under the strain, Mr. Mooney, had on his hands a difficult task. Agwi then was reporting monthly big operating deficits and it had unpaid commitments of about $20,000,000 in connection with oil and other enterprises. Under his management, the company was guided safely through the depression and discontinued the use of red ink at the end of 1923. Since that time its reports have been increasingly favorable. The company has wiped out previously incurred bank loans, reduced its bonded indebtedness, built or modernized many fine terminals and carried out a shipbuilding program involving the expenditure of nearly $20,000,000. This includes four large fast combination passenger and freight boats, already delivered, three similar vessels of the same type now under construction, and the purchase of a number of boats from the United States shipping board. The company also has nearly completed the return to its treasury of its great investment in oil enterprises.

The man under whose guidance and leadership this achievement has been accomplished, was born at Elizabeth, N. J., in 1873. He was educated in the schools of that city. At the age of 18, he entered the employ of Miller, Bull & Co., New York, who later became Miller, Bull & Knowlton. This firm, among its other important shipping activities, was part owner of the New York & Porto Rico Steamship Co., and Henry T. Knowlton was treasurer of that line. One day, John E. Berwind, controlling factor in the New York & Porto Rico line, worried by the illness of Mr. Knowlton, sent for young Mooney and told him to go over and see that things were taken care of during Mr. Knowlton's absence. On the death of Mr. Knowlton, in 1903, Mr. Mooney was appointed general manager of the New York & Porto Rico Steamship Co. He continued to occupy this post after the New York & Porto Rico Steamship Co. went into the merger known as the Consolidated Steamship Lines and which, in 1908, was reorganized as the Atlantic, Gulf & West Indies Steamship Lines.

In 1915, Mr. Mooney was elected president of the New York & Porto Rico Steamship Co., succeeding Henry R. Mallory. Later, he was elected vice president of the parent company, the Atlantic, Gulf & West Indies Steamship Lines. In 1921 he was elected president of the latter company. In that capacity he is the chief executive of the holding company which controls and directs many important interests, chief of which are the Clyde Steamship Co., Mallory Steamship Co., New York & Cuba Mail Steamship Co., New York & Porto Rico Steamship Co., the Southern Steamship Co., Atlantic Gulf Oil Corp. and Colombia Syndicate.

He is president of the following corporations: Atlantic, Gulf & West Indies Steamship Lines, Agwi Trading Corp., Agwi Transportation Co., Atlantic Gulf Oil Corp., Coamo Steamship Co., Colombia Syndicate, Cia. Petrolera del Agwi,

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Centralize Control on Bridge

The Control Station of a Modern Ship Is on the Bridge—For Receiving and Sending Information to Co-ordinate All Functions

BY O. B. WHITAKER

THE "control station" of the modern ship is on the bridge. The reasons which are bringing about this centralized control on shipboard are the same as those which have made necessary a similar control of large power plants ashore. An efficient and smoothly operated business of any kind involving the co-ordination of sub-units requires a station for the receipt and dissemination of information to keep all sub-units working harmoniously and efficiently. The operation of a ship is one of the finest and most concrete examples of such co-ordination. The ship is at the dock ready to sail: all lines are ordered "let go," the engine telegraph on the bridge is put to "slow astern;" the whistle is sounded from the bridge; orders are given to assisting tugs from the bridge, —in short the bridge is headquarters or the "control station" of a mass of unified action. The alert captain knows or wants to know what every one of the various units comprising his command are doing. On the old sailing vessel everything was under his thumb, but when mechanical power displaced Aeolus as the propelling agent, an important part of the captain's command became specialized under another head. But it did not relieve the captain of the responsibility of maneuvering and navigating his ship, consequently he must have complete control of the engines, steering machinery, ballasting, etc., in addition to loading and discharging the cargo, entering and clearing his ship and endless other duties.

Facilities for giving orders to various parts of the ship from the bridge were provided when steam displaced sail. This alone, however, leaves many things to be desired as it is of advantage for the captain to know his speed through the water, the speed of his engines, the position of his helm rudder, the draft of the ship and many other things. Early attempts at providing an indication of the ship's speed in the wheel house were an indicator which operated electrically from the taffrail log, and the helm angle indicator to show the position of helm or rudder. Only a measure of success was reached in those efforts, however, due largely to the lack of interest which this field held for the large industrial, electrical equipment manufacturers, because of its limited application.

The introduction of the Sperry gyro-compass into the merchant service seven years ago brought with it the general interest of a responsible and highly skilled organization, including engineers who have had a great deal of sea experience in the United States navy and in many foreign navies. Their first interest was, of course, the development of the gyro-compass to adapt it to the requirements of the merchant service. The study and research required for this work pointed out many desirable things in addition to the gyro-compass which would assist in the safe and efficient handling of ships. Following closely behind the introduction of the gyro-compass came the Sperry gyro-pilot, popularly known as "metal mike." This places in the hands of the captain and his deck officers a machine for automatically steering the ship, and it utilizes either the ship's steering system or attaches directly to the steering machinery aft; but in either case, it is controlled from the bridge. It was soon found that to obtain the best results from the gyro-pilot, definite knowledge of the rudder action

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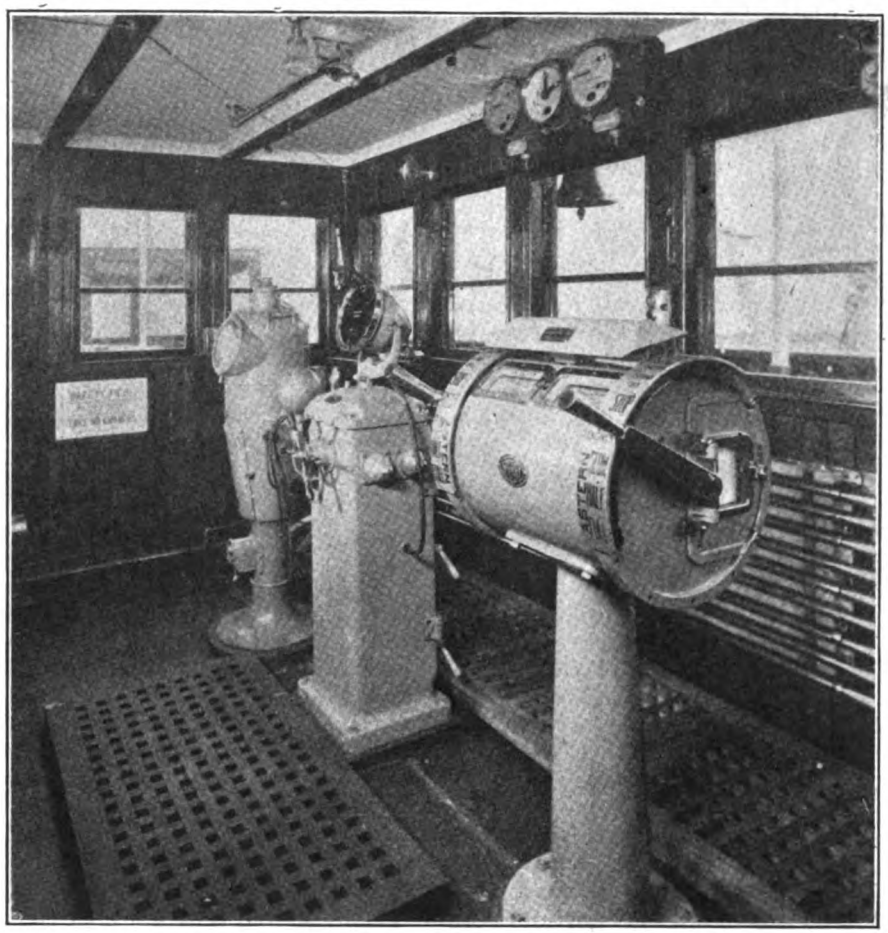

BRIDGE OF THE M. S. EAST INDIAN—THE GYRO-PILOT IN THE CENTER FOREGROUND —TO THE RIGHT THE RECORDING ENGINE TELEGRAPH—OVER CENTER WINDOW, ENGINE COMPARATOR AND ENGINE SPEED INDICATOR WITH HELM INDICATOR AT TOP RIGHT

The author, a member of the staff of the Sperry Gyroscope Co., Brooklyn, N. Y., has had considerable sea experience as an officer in the United States navy.

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From the Old Log Book

Stray Items About the Great Lakes, Atlantic, Pacific and Gulf Coasts and Inland Rivers from MARINE REVIEW Files of 10, 20, 30 and 42 Years Ago

NOVEMBER, 1884

AN INTERESTING item in the *Marine Record*, then the name of MARINE REVIEW and a weekly, 42 years ago, mentions the trial trip of the then new Cunarder UMBRIA. This trial took place on the Clyde, Oct. 4, 1884. The new vessel, the account stated, steamed 30 miles at a speed of 21 knots. The account went on to say that the UMBRIA was the largest vessel afloat with the exception of the GREAT EASTERN. She was 520 feet long; 57 feet 3 inches in beam, and 41 feet deep, and in the words of the old account, "She measured over 8000 tons." The UMBRIA was built in the Fairfield yard at Govan.

* * *

IN THE light of present-day naval architecture with the Majestic approaching 1000 feet in length and over 100 feet in beam, the Umbria now seems but a small craft. We are told that the electric light was used and that she had accommodations for 720 first class passengers with no steerage accommodations. The propeller was made of manganese bronze and it was said that the qualities of manganese bronze combined with the development in practice of the true proportions of the screw propeller were computed to add upward of a knot to the perfarmance possible with the old fashioned cast iron blades. It was said that the vessel could carry coal for 16 days steaming at 18 knots. The Umbria sailed from Liverpool for New York on her maiden voyage Nov. 1, 1884.

NOVEMBER, 1896

IN THE Nov. 5, 1896, number of MARINE REVIEW is found a very interesting record of the trials of the 400-foot lake freighter SENATOR. The SENATOR was built by the Detroit Dry Dock Co. and was fitted with the Howden system of hot draft.

* * *

THE trial showed a consumption of 1.66 pounds of coal per horsepower per hour. The SENATOR *had already made seven trips before this trial data was obtained. She was in the ore trade from Ashland to Ohio ports, going up light each time. The following facts on her performance are interesting: The cost of fuel per round trip was* $311.08, *this amount representing* 154 *tons at an average price of* $2.02 *per ton. Her average speed, loaded and light, was* 12½ *miles an hour.*

* * *

THIRTY years ago the MARINE REVIEW pointed out that although our own navy had investigated and laid aside the question of oil for fuel, the German authorities were about to equip several of their vessels with appliances for using oil; also that the British admiralty was conducting experiments along this line on an extensive scale.

* * *

THIS is an indication of a fact well known—that in many ways we are a conservative people when it comes to departure from accepted practice. However, once started, the development is apt to be rapid, as witness electric propulsion in American ships of war.

NOVEMBER, 1906

A COMPLETELY illustrated article was published twenty years ago on the OGDENSBURG, a car ferry and passenger steamer for the Canadian Pacific Railroad and Transfer Co. In the light of present day practice it is interesting to observe by comparison the advances which have been made in this type of craft. For instance, electricity generated by diesel engines and applied to propulsion motors is no longer novel for this type of vessel.

* * *

SOME very interesting photographs of the Cunard liner MAURETANIA *were published in the* MARINE REVIEW *twenty years ago. Incidentally, some startlingly out-of-date looking automobiles were illustrated in conjunction with this vessel's turbine casings to give a comparative idea of their size.*

* * *

RECENT talk in British shipping circles about the placing of an order for a new transatlantic liner of tremendous size also hints at the possibility of the Cunard line replacing with a modern ship the same famous Mauretania described in the article mentioned above and which has served the traveling public with speed, comfort and safety for so many years. Twenty years in the life of a ship is a long time and the advance made in the arrangement and fittings of public rooms and passenger quarters make a vessel of this age comparatively obsolete. In speed this vessel has never been eclipsed and the chances are that not much if any greater speed will be called for in any new vessel projected.

NOVEMBER, 1916

SHIPBUILDING was the slogan of the day ten years ago. Foreign shipping men unable to get orders through in their own country came to the United States and placed orders in American yards. On Sept. 21, 1906, the NIELS NIELSON was launched from the yards of the Skinner-Eddy Corp. at Seattle. Two days later the American steamship CAUTO was launched at the Seattle Construction Dry Dock Co. for the New York & Cuba Mail Steamship Co. The NIELS NIELSEN, a vessel of 8800 tons deadweight, with a length of 423.9 feet, was the largest merchant vessel constructed up to that time on Puget sound. The same yard had under order at the time ten additional steamers for foreign and American owners.

* * *

HOW difficult it was to grasp at that time the ephemeral nature of shipbuilding in the United States! Today, ten years after this boom, the ordering of a ship is a rare and unusual occurrence.

* * *

WE LEARN from Marine Review ten years ago that a small bronze tablet was put up bearing this inscription: "Boston Light built at this place by the Province of Massachusetts was first lighted Sept. 14, 1716, Old Style destroyed 1776 and rebuilt 1783." In small letters on the tablet it was recorded that it was placed there by the United States Lighthouse service, Sept. 25, 1916, to commemorate the two hundredth anniversary.

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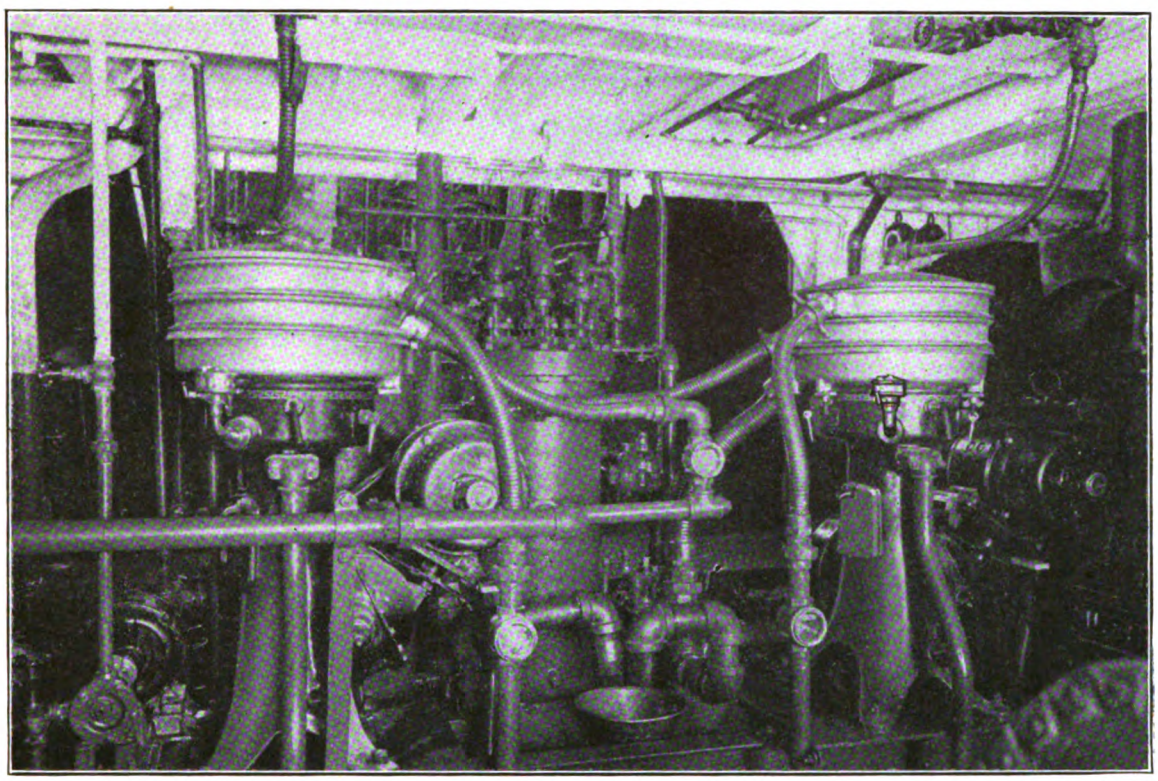
Oil Purifiers Are Needed On All Oil Engine Ships

BY RALPH L. YOUNG



Two centrifugal oil purifiers on the M. S. EAST INDIAN for removing impurities from the fuel oil—They are fitted with closed inlet and discharge connections to prevent escape of vapors at high temperatures

EXPERIENCE, which is still the best teacher, has shown the majority of operators of diesel driven vessels that a positive means of purifying lubricating oil is necessary in order that their engines may operate with maximum reliability and economy.

Although designers of oil engines have made great strides in the direction of keeping carbon and other abrasives out of the crankcase, the very principle upon which the engine is built seems to forestall complete elimination and we do not believe that any manufacturer will object to the statement that even in the best diesel engines now being built the accumulation of carbon in the crankcase after several thousand miles of operation is sufficient to seriously impair the lubricating value of the oil.

In marine work particularly, the centrifugal oil purifier seems to be the only logical method to employ in removing this carbon, or at least that part of it which is removable by mechanical means or precipitation. Another feature of the centrifugal which makes it particularly useful in marine work is its great efficiency in separating water from oil.

Save Lubricating Oil

One of the first objections raised against the diesel engine was its high consumption of lubricating oil and it is only fair to give the centrifugal purifier due credit for completely counteracting this argument. When water and solid impurities are continuously removed from the oil it can be kept in service indefinitely and in modern engines which are designed so that the actual consumption or burning up of oil is almost nil, it has been found that the only make-up oil needed is that which finds its way into the crankcase from the cylinder lubricators. This is true of the two 2500-horsepower Sun-Doxford engines which drive the M. S. EAST INDIAN of the Ford Motor Co.

During her first 20,000 miles of service, average consumption of lubricating oil was but eight gallons a day for the two engines, all of it going through the lubricators. Two lubricating oil purifiers are installed on this vessel and over 5000 gallons of oil goes through them each day. Each engine holds 400 gallons of oil which means that all the oil in circulation is purified between six and seven times daily. What this means in the way of better lubrication is shown by the fact that upon the completion of 20,000 miles the oil in the system was declared by competent engineers to be equal to new.

While we do not propose to confuse the reader by injecting into this discussion of lubricating oil purification too much data with regard to the purification of fuel oil, it may be well to mention here that results of the EAST INDIAN are, perhaps, made still more satisfactory from a strictly lubricating standpoint by the use of two fuel oil

(*Continued on Page 80*)

The author, Ralph L. Young of the De Laval Separator Co., prepared this article at the request of the editor.

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Late Decisions in Maritime Law

Legal Tips for Shipowners and Officers

Specially Compiled for Marine Review
By Harry Bowne Skillman
Attorney at Law

REQUIREMENT of a charter party that the charterer should pay outward pilotage "at loading ports" was not limited to pilotage, when the vessel was outward bound from the last port of loading, but included all pilotage outgoing after any part of the cargo had been laden; a further provision giving the charterer the right to load at two ports, by paying all extra port charges at the second port, covered all customary charges at such port, made in connection with the entry of the ship, securing and loading cargo, and departure of the ship from the port.—Trafikaktiebolaget Grangesberg Okelosund v. Wilkens, 4 F. (2d) 577.

* * *

IT WAS decided in the case of Hastorf Contracting Co. v. Ocean Transportation Corp, 4 F. (2d) 583, that stevedores undertaking to stow cargo were primarily liable for crushing the barge's deck by negligently concentrating the cargo in two spots, though they were not bound under contract to lade the barge; that, though the bargee is the owner's agent to say when the barge is fully laden, he is not responsible for failing to protest against the stevedores' method of stowing rails or telling the stevedores how to do so; that the bargee is responsible for warping the barge to a safe berth, avoiding known dangers, pumping, covering the hatches, stopping the load at the barge's capacity, and other matters which he must do alone, but he is not responsible for matters which the stevedores may be assumed to know.

* * *

WHERE the failure of those in charge of a pumping crib in Lake Michigan to ring the fog bell, as required by law, was sufficient to account for a collision with the crib by a steamship in a fog, the vessel could not be charged with contributory fault except on clear evidence. There is no rule, it was said in the case of Goodrich Transit Co. v. City of Chicago, 4 F. (2d) 636, which requires a steamship, on approaching Chicago on Lake Michigan in a fog, to stop until she ascertains the position of a pumping crib maintained by the city, which is required by law to keep its fog bell ringing as notice to shipping.

* * *

THE fact that a contract for salvage services was made with the insurer of the vessel, payment to be made only on their success, did not deprive the salvor of his right to a lien on the vessel to the amount of the contract price; services rendered in pumping out a schooner, pulling her off a bank where she had been stranded during a storm, and safely anchoring her, constituted "salvage services."—LEONIE O. LOUISE, 4 F. (2d) 699.

* * *

A VESSEL licensed in the coastwise trade in taking contraband cargo from foreign ships at sea, with which she was proceeding toward the coast, was held, in the case of ROSALIE M., 4 F. (2d) 815, to be employed in a trade other than that for which she was licensed, and to be subject to forfeiture. It was also held that officers of a revenue cutter have authority to seize and search a vessel within the waters of the United States, where there is probable cause to suspect her of smuggling or attempting to smuggle goods into the United States, and such seizure and search may be made outside of such waters, subject only to diplomatic considerations.

* * *

SEAWORTHINESS depends upon the kind of cargo carried, said the court in the case of OAKLEY C. CURTIS, 4 F. (2d) 979, and it was held that damage to linseed caused by leaks about the pumphouse on the 'tween decks, and a hole in the galley floor, were chargeable to the ship, such leaks and hole constituting an unseaworthy condition.

* * *

WHERE a bill of lading gave a vessel discretion to deviate from the usual course, and where it was necessary for the vessel to deviate from her course to replenish supplies and to repair sails, there was no deviation affecting relations or obligations of the vessel, since "deviation" to have such effect must be a voluntary departure without necessity or reasonable cause; and where a vessel was seaworthy in every particular at the outset of the voyage and damage to coffee by sea water was due to so severe a storm that it might be properly regarded as a peril of the sea, the ship was not liable.—ROSALIE HULL, 4 F. (2d) 985.

* * *

BOTH tugs were held at fault in the case of Edward J. Barton Lighterage Co. v. Davis, 4 F. (2d) 999, for a collision occurring in the darkness of early morning, as both left their respective slips, separated by an intervening pier, one for not maintaining a lookout, and the other for failure to observe the movement of the tug first leaving its slip, failure to blow the proper whistle, and lack of vigilance, both vessels proceeding at five miles an hour, when signals of a nearby vessel should have apprised a careful navigator of the proximity of trouble.

* * *

ORDINARILY an owner is not free from personal fault who sends a vessel to sea in a leaky condition, but an owner of a new wooden ship was without personal fault, it was decided in the case of In Re McDonald Transportation Co., 4 F. (2d) 1010, where there was no evidence of a leak before commencement of the voyage, and during the voyage there was no opportunity for repairs, the leak being easily controlled by pumps and in no way endangering the ship, though, due to improper dunnaging, the cargo was damaged by water.

* * *

THE rule of limited liability of owners of vessels," stated the Supreme Court of the United States in the case of Evansville & Bowling Green Packet Co. v. Chero Cola Bottling Co., 46 Sup. Ct. Rep. 379, "is an ancient one." It was then said, "It has been administered in the courts of admiralty in Europe from time immemorial, and by statute applied in England for nearly two centuries. Our statutes establishing the rule were enacted to promote the building of ships, to encourage the business of navigation, and in that respect to put this country on the same footing with other countries. The rule should be applied having regard to the purposes it is intended to subserve and the reasons on which it rests." The court held that a carrier's wharfboat, attached to shore by cables and used as office, warehouse, and wharf, having water and electric light connections and telephone system, was not a "vessel" as defined by federal statutes so as to come within the rule of limited liability for damages to merchandise situated thereon when it sank.

* * *

WHERE a vessel backing out of a slip under her own power collided with a vessel on the other side of the slip, tugs engaged to move, her, but which at the time of the collision were waiting at the mouth of the slip, and had not undertaken the work of moving the vessel, were not liable, it was held in the case of HELBN, 5 Fed. (2d) 54. It was also decided that the collision impressed upon the wrongdoing vessel a maritime lien, which goes with the vessel into whosesoever hands it may come.

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Ohio River Traffic Increases Three-Fold in Seven Years

Speakers at the Thirty-Second Annual Convention of the Ohio Valley Improvement Association Stress Need of Modern Terminals

BY J. F. FROGGETT

PRESSING forward to completion of the canalization of the Ohio river by a 9-foot channel from Pittsburgh to Cairo, Ill., within the year 1929, delegates to the thirty-second annual convention of the Ohio Valley Improvement association turned the Paducah, Ky., meeting on Oct. 11 and 12 into a congratulatory affair. Yet they kept a sharp eye turned to the completion and commercial utilization of the $100,000,000 government project. Hence the delegates listened intently to the repeated injunction of authoritative speakers to fix the attention of their own municipal authorities upon the solution of the problem of proper terminals to care for the oncoming flow of the promised commerce at towns all along the entire 1000-mile stretch of improved waterways to the Mississippi river.

Congratulating the association upon its accomplishments so far in the improved Ohio river to Louisville, Secretary of War Davis in a message to the Paducah convention pointed out that from 1919 to 1924, the "total commerce on the Ohio increased from 5,000,000 to 11,000,000 tons, while in 1925 it was 16,000,000 tons and it promises to reach 18,000,000 tons in 1926." And this, too, although the river still is in an uncompleted state. But he warned his hearers they must prepare to provide quickly the proper terminal facilities "without which the waterway alone is like a railroad without rolling stock, transfer yards, stations or handling or storage facilities."

Promote Building of Terminals

Acting upon this hint, the two-day convention turned itself largely into a missionary society for the spread of the gospel of adequate river terminals, either with or without municipal help. The examples set by the Rail-River Transfer Co. at Cincinnati, and the Kelly Transportation Co. of Charleston, W. Va., in building up-to-date terminals with the newest mechanical freight handling equipment, were pointed to repeatedly by the various speakers, and with just pride at the enterprise thus early shown by Ohio river improvement advocates.

Major General Edgar Jadwin, chief of the United States army engineers, spoke hopefully of the progress being made in completion of Ohio river improvements by 1929. He said in 1925 a total of 50,000,000 tons of all kinds of freight were carried on the waterways of the Mississippi river valley, of which 16,000,000 tons, or an increase of 50 per cent, were carried on the Ohio river alone. Mississippi river traffic even in the palmy days of Mark Twain carried nothing like the present volume being transported on the Mississippi, 13,000,000 tons last year, or excluding 5,000,000 tons of oil, leaving 8,000,000 tons, against 2,000,000 tons in the "golden days" of long ago. Citizens of Minneapolis and St. Paul have just raised $670,000 with which to build adequate facilities for using the upper Mississippi river when the 9-foot stage is finished within a few years between St. Louis and Cairo, Ill. "In fact," declared General Jadwin, "the inland waterways projects look so good at this time I am wondering if it all is not too good to be true."

President Oscar F. Barrett, of Cincinnati, in his annual report pointed out that the end of the original purpose of the organization is almost in sight, the completed canalization of the Ohio river. He urged the delegates to begin now to prepare for the grand opening of the completed river in 1929 when the President of the United States will be asked to take part in the celebration of the formal ending of the third of a century struggle to gain this great improvement.

On Tuesday afternoon the delegates boarded the U. S. engineers' towboat MIAMI at Paducah and spent the afternoon inspecting the river work now in course of completion down as far as Metropolis, Ill. There they saw an electric crane and magnet transferring pig iron produced at Florence, Ala., that came down the Tennessee river to the Ohio in a barge to Illinois Central railroad cars on the bank, just as they have been doing for some years and exerting a strong influence upon the pig iron markets in Chicago, St. Louis, Detroit and Cleveland.

Of the total of 50 locks and dams in the original plans for the canalization of the Ohio river, all but 8 have been completed and are working. Reports on the progress of the work by Col. C. W. Kutz, division U. S. engineer in charge of Ohio river improvements, Cincinnati; and Lt. Col. G. R. Spaulding, district engineer in charge of the Louisville district, made the following fine showing of progress: Dam No. 45 at Addison, Ky., 95 per cent completed; No. 46 at Owensburg, Ky., 62 per cent completed; No. 47 at Newburg, Ind., 63 per cent; No. 49 at Uniontown, Ky., 66 per cent; No. 50 at Ford's Ferry, Ky., 45 per cent; No. 51 at Golconda, Ill., 27 per cent; No. 52 at Brookport, Ill., 45 per cent; and No. 53 at foot of Grand Chain, 35 per cent.

Election of officers resulted in the re-election of the following: President, Oscar F. Barrett, Cincinnati; secretary W. C. Culkins, Cincinnati; and treasurer George Puchta, Cincinnati; members of the executive finance committee Edwin C. Gibbs, chairman, Cincinnati; W. C. Culkins, George F. Dieterle, Maurice Friberg, R. P. Gillham, A. K. Nippert, Julian A. Pollak, George Puchta and James A. Reilly, all of Cincinnati; and James T. Hatfield, Covington, Ky. A long list of vice presidents was chosen in which the important towns and cities all along the river were represented.

The author, J. F. Froggett, representing MARINE REVIEW, attended the convention which met in Paducah, Ky., Oct. 11-12.

Launch Electric Ferries

The diesel electric ferryboats CHARLES W. CULKIN and GOVERNOR MOORE were launched Oct. 21 at the plant of the builder, the American Brown Boveri Electric Corp. at Camden, N. J.

These two boats are the first of six diesel-electric ferries which are under construction at Camden, for the Diesel Electric Ferries Inc. who will operate a ferry service across the Hudson river, New York City, in conjunction with the Erie railroad.

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Order Large Freighter from American S. B. Co.

A new vessel, to be the largest ore carrier on the Great Lakes, has been ordered by the Interlake Steamship Co., Pickands Mather & Co. managers, Cleveland. This vessel will be built by the American Shipbuilding Co. at the Lorain, O. plant and will be completed and ready for service early next summer.

She will be 630 feet in length overall, 65 feet in beam and 33 feet deep. On a draft of 20 feet this steamer will carry 13,800 long tons of cargo. Over 5000 tons of steel will be required in building her. The usual type of triple expansion steam engine will be used with cylinders 25½, 41 and 67 inches in diameter and 42 inches in stroke. Boilers will be of the water tube type.

Five new vessels of the largest size have now been ordered by the Interlake Steamship Co. since August 1925, all contracted for with the American Shipbuilding Co. The first two, the COL. JAMES PICKANDS and SAMUEL MATHER were delivered at the start of the season this year and are in active service. The third vessel, the WILLIAM MCLAUCHLAN was launched Oct. 7, and the fourth, ROBERT HOBSON, was launched Oct. 30. These two will be ready for the opening of navigation in 1927.

With the addition of these five freighters about 300,000 long tons carrying capacity per season has been added to the Interlake fleet. This fleet wil include 20 first-class steamers 7 of which are 600 feet in length, and is the second largest on the great lakes. The new steamers coming out next season will replace the vessels of smaller class sold to the Paterson's Steamship Ltd.

Employment will be furnished for a large number of men at the Lorain plant, the new order making six large steamers under construction or to be built for 1927 delivery. The Kinsman Transit Co., Inland Steamship Co. and the Bradley Transportation Co. each have a vessel building The Bradley boat, a self-unloader, will be much the largest boat of her class, being 638 feet in length overall.

Ocean Freight Rates

Per 100 Pounds Unless Otherwise Stated

Quotations Corrected to Oct. 22, 1926 on Future Loadings

NOTE: FREIGHT RATES STEADY WITH MARKED INCREASE TO SOME PORTS

New York to	Grain	Provisions	Cotton (H. D.)	Flour	General cargo cu. ft.	General cargo 100 lbs.	††Finished steel	REMARKS Freight Offered
Liverpool	6s 0d-7s	$0.50	$0.50	0.35	$0.40	$0.75	$7.00T***	Very good
London	6s 0d‡	0.50	....	0.35	0.40	0.75	7.00T***	Very good
Oslo	$0.30	0.45	0.50	0.30	0.42½	0.85	7.00T	Very good
Copenhagen	0.32	0.45	0.40	0.35	0.42½	0.85	7.00T	Very good
Hamburg	0.35	0.35	0.50	0.40	0.37½	0.75	8.00T	Very good
Bremen	0.30	0.35	0.45	0.35	0.37½	0.75	8.00T	Very good
Rotterdam and Amsterdam	0.35	0.32½	0.60	0.40	0.35	0.70	7.50T	Very good
Antwerp	0.30	0.32½	0.40	0.35	0.35	0.70	7.50T	Very good
Havre	0.30-35	0.50	0.45	0.35	0.40	0.75	8.00T	Very good
Bordeaux	0.30	0.50	0.45	0.35	0.40	0.75	8.00T	Fair
Barcelona	....	12.00T	0.30	10.00	—12.00T—		8.00 to 15.00T	Fair
Lisbon	....	0.65	0.40	7.00T	—20.00T—		7.00T	Good
Marseilles	....	0.55	0.30	6.00	—20.00T—		5.50T	Fair
Genoa	0.35	12.50	0.40	7.00	—20.00T—		10.00T	Fair
Naples	0.35	12.50	0.40	7.00	—20.00T—		10.00T	Fair
Constantinople	0.35-40	17.00T	0.75	0.40	—20.00T—		9.00T	Very good
Alexandria	....	17.00T	0.75	0.40	—20.00T—		9.00T	Very good
Algiers	....	0.75	0.50	0.40	—20.00T—		10.00T	Very poor
Dakar	....	15.00	....	14.00T	—21 00T—		10 50T	Very good
Capetown	Open	20 00	....	13.00T	—20 00T—		11.00 to 18 00T	Very good
Buenos Aires	....	20.00T	....	....	—20.00T†		8.00T	Very good
**Rio de Janeiro	....	22 00T	....	8.00T	20.00 to 22 00T†		7.00 to 7.70T†	Very good
Pernambuco	....	22.00T	....	9 00T	—22.00T—†		9.70T†	Very good
Havana	0.22½*	0.50	....	0 22½*	....	....	4 00*	Good
Vera Cruz	....	0 30	0.35	0 25	0.52½	1.05	0.30 to 0.35	Good
Valparaiso	....	1.07	....	0 70	0.45	0.80	10 00T	Good
San Francisco	....	0.35 to 0.70	....	0.50 to 1.10	....	....	0.25 to 0 80	Fair
Sydney	....	18.00T	1 25	18 00T	18.00-24 00T		9.00-12 00T	Fair
Calcutta	....	....	0.60	10 00T	—16 00T—		10 00T	Fair

T—Ton. ‡Per quarter of 480 lbs. †Landed. ††Heavy products limited in length. *Extra charge for wharfage. **Plus $0.50 surcharge on all rates to Rio de Janeiro on account of congestion. ***Plus 15 per cent.

From North Pacific Ports to	Lumber Per m. f.
San Francisco	$4.50 to 5.00
South California	4.50 to 5.00
Hawaiian Islands	9.50 to 10.50
New Zealand	16.00 to 19.00
Sydney	12.00 to 14.00
Melbourne-Adelaide	13.00 to 14.50
Oriental Ports	10.00 to 11.00
Oriental Ports (logs)	14.00 to 16.00
Peru-Chile	12.50 to 14.00
South Africa	16.50 to 18.00
Cuba	15.00 to 16.00
United Kingdom	70s to 85s
United Kingdom (ties)	70s to 80s
Baltimore-Boston range	$14.00 to 15.00
Florida Range	No rates
Buenos Aires	14.00 to 15.00
	Flour and Wheat
U. K. and Continent (gross ton)	37s 6d to 40s
Oriental Ports (net tons)	$4.25 to 5.00

Principal Rates To and From United Kingdom

	s	d		s	d
Grain, River Plate to United Kingdom	29	6	Pig iron, United Kingdom to New York or Philadelphia	12	6
Coal, South Wales to Near East	—	–	Iron ore, Bilbao to Cardiff	5	10
Coal, United Kingdom to Buenos Aires	—	–	Iron ore, Huelva to Phila. or Balto	11	6
Manganese Ore, Poti to Philadelphia	$3.70				

NOTE: Lighterage rates on fuel in New York reduced from 6½ to 5½c per barrel. Owing to the coal stoppage in Britain no outward freight rates or bunker prices for coal or pig iron are quoted.

General cargo rates to Havana change daily and are omitted for the time being.

After Nov. 1 rates to Marseilles and Algiers will go up 15%.

Rates to Calcutta are subject to change without notice. Cotton goes only to Bombay.

Bunker Prices

At New York

	Coal alongside per ton	Fuel oil alongside per barrel	Diesel engine oil alongside per gallon
Nov. 18, 1925	5.50@5 60	1 70½	5 00c
Dec 18	5 60	1 70½	5 00
Jan 2	5 50@6 25	1.75@1.80	5 25
Mar. 18	5 60@5 80	1 80½	5 50
Apr. 22	5 25@5 60	1.80@1.81½	5 75
May 19	5 25@5 60	1 80½	5 88
June 18	5 50@5 60	1 80½	6 08
July 20	5 00@5 60	1 80½	6 08
Aug 12	5 00@5 60	1 81½	6 10
Sept 18	5 45@6 00	1 81½	6 05
Oct. 22, 1926	7.25@7.50	1.70½	5.86

At Philadelphia

	Coal trim. in bunk per ton	Fuel oil alongside per barrel	Diesel Eng. oil alongside per gallon
Dec. 18, 1925	5 15@5 50	1.71@1.74½	4 89@5 15c
Jan 20	5 50@6 25	1 71@1 79	5 00@5 65
Feb 18	5 80	1 78@1 86½	5 14@5 50
Mar 18	5.00@5.25	1 80@1 86½	5 40@5 65
Apr. 22	5 25	1 77@1.86½	5.90@5 93
May 19	5 25@5 70	1 82@1 86½	6 15@6 38
June 18	4 50@5 15	1 80@1 86½	6 15@6 43
July 20	5 10@5 50	1 74@1 81½	5 00@6 15
Aug. 12	5 00@5 25	1 69@1 74½	5.75@6.17
Sept. 18	5 00@5.35	1 74@1 74½	6.14½
Oct. 22, 1926	7.25@7.50	1.74@1.80½	5.66@5.88

Other Ports

Boston, coal, per ton	$7.36
Boston, oil, f. a. s., per barrel	$1.77
Hampton Roads, coal, per ton, f.o.b., piers	$7 25-7.50
July 9 — Cardiff, coal, per ton	—s –d
London, coal, per ton	—s –d
Antwerp, coal, per ton	—s –d
Antwerp, Fuel oil, per ton	77s 6d
Antwerp, Diesel oil, per ton	97s 6d
British ports, Fuel oil	72s 6d
British ports, Diesel oil	87s 6d

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Marine Business Statistics Condensed

Record of Traffic at Principal American Ports for Past Year

New York

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1926....	492	2,087,694	548	2,270,398
August	491	2,034,147	507	2,075,643
July	493	1,943,133	546	2,251,396
June	542	2,337,678	563	2,279,208
May	448	1,856,777	538	2,126,788
April	483	1,967,964	538	2,248,081
March	523	2,090,347	511	2,033,938
February	404	1,591,273	454	1,826,886
January	407	1,671,761	463	1,883,094
December, 1925....	481	1,706,900	510	2,022,775

Philadelphia

(Including Chester, Wilmington and the whole Philadelphia port district)
(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1926....	107	234,144	82	196,434
August	109	248,435	81	170,661
July	92	191,680	69	128,381
June	104	229,631	56	109,561
May	97	215,829	69	151,287
April	80	185,401	61	135,919
March	107	264,754	72	158,858
February	78	184,715	52	113,768
January	76	206,081	52	136,040
December, 1925....	83	194,283	53	142,885

Boston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1926....	105	308,189	83	246,136
August	128	321,377	96	206,879
July	152	336,135	108	274,513
June	164	370,526	109	262,468
May	134	277,009	111	261,878
April	101	285,245	77	210,542
March	117	356,482	62	173,217
February	92	263,475	42	136,613
January	97	287,335	55	156,167
December, 1925....	96	270,869	67	210,652

Portland, Me.

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1926....	24	43,783	19	35,828
August	23	47,089	26	45,669
July	27	47,885	26	47,569
June	29	44,390	29	46,942
May	19	49,894	17	47,016
April	23	48,836	32	73,947
March	34	97,413	31	88,462
February	23	64,150	23	66,660
January	26	78,508	27	81,917
December, 1925....	31	85,651	29	75,072

Providence

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September 1926....	5	20,651	5	22,324
August	6	20,764	3	12,299
July	7	29,207	5	18,641
June	5	17,954	3	8,355
May	7	25,057	6	20,806
April	8	28,449	5	23,480
March	15	47,557	8	34,025
February	8	29,622	7	30,033
January	5	20,355	6	24,221
December, 1925....	16	52,660	6	27,149

Portland, Oreg.

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1926....	33	126,772	56	201,152
August	40	150,609	46	167,419
July	24	93,977	33	127,270
June	22	77,850	45	156,103
May	35	128,351	43	152,890
April	17	66,789	29	107,892
March	21	85,073	38	134,432
February	23	81,440	33	114,147
January	22	84,722	26	97,068
December, 1925....	23	86,443	40	144,392

Baltimore

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1926....	230	678,127	224	670,465
August	228	672,453	221	639,677
July	211	644,261	202	603,648
June	138	402,230	132	371,781
May	120	369,729	121	355,443
April	107	330,401	110	326,649
March	120	382,983	119	362,256
February	102	304,714	99	288,640
January	97	302,341	88	264,249
December, 1925....	105	314,958	109	332,721

Norfolk and Newport News

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1926....	252	705,604	281	766,503
August	188	545,861	255	733,837
July	267	727,374	309	854,305
June	78	215,803	171	502,701
May, ...	40	107,858	140	368,515
April	21	45,875	126	305,549
March	22	40,160	140	395,033
February	20	48,377	108	298,756
January	26	69,958	96	256,019
December, 1925....	24	57,907	100	279,570

Savannah

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
March, 1926	48	102,126	41	99,244
February	40	97,908	46	121,792
January	38	103,029	38	106,472
December	37	101,726	35	91,141
November	37	112,158	38	117,064
October	45	125,766	47	126,452
September	50	137,080	39	103,408
August	34	77,027	39	87,455
July	38	97,332	34	91,981
June, 1925	26	60,788	27	60,924

Key West

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1926....	81	91,321	80	88,844
August	84	98,702	87	99,362
July	78	86,124	77	86,323
June	94	110,100	94	108,581
May	114	126,089	109	120,597
April	88	101,331	88	99,227
March	102	117,292	90	114,917
February	70	85,607	69	88,229
January	80	110,684	81	110,084
December, 1925....	89	121,193	88	113,996

Mobile

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1926....	84	179,225	75	165,838
August	89	166,164	81	158,197
July	86	153,642	84	159,256
June	89	168,610	89	163,318
May	99	183,795	95	191,442
April	109	205,035	98	178,025
March	125	228,481	115	221,022
February	100	153,884	92	188,057
January	109	212,005	78	150,384
December, 1925....	104	183,941	89	173,371

Seattle

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1926....	54	219,623	58	233,320
August	53	229,111	48	206,042
July	35	146,670	31	126,407
June	39	165,989	42	181,090
May	39	159,755	44	163,718
April	51	215,641	47	191,161
March	38	166,536	45	184,067
February	42	168,308	45	182,920
January	45	182,889	50	204,058
December, 1925....	47	201,460	55	231,787

New Orleans

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1926....	226	620,095	240	666,778
August	275	764,464	256	721,654
July	268	716,066	270	739,005
June	255	658,385	221	665,960
May	287	753,621	284	772,138
April	248	626,277	296	694,673
March	295	754,863	300	751,054
February	255	717,048	250	691,747
January	241	659,776	248	652,209
December 1925....	273	750,625	279	764,022

Charleston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net. tonnage	—Clearances— No. ships	Net tonnage
September, 1926....	22	65,872	34	98,447
August	24	64,334	20	51,505
July	13	37,020	13	33,908
June	8	27,095	10	30,601
May	5	18,321	10	20,514
April	11	37,459	12	27,166
March	18	64,432	20	49,897
February	10	35,629	10	21,945
January	8	27,610	13	27,237
December, 1925....	14	38,441	10	26,597

Galveston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1926....	52	139,219	127	368,302
August	55	129,477	131	389,432
July	60	164,241	116	352,290
June	53	119,497	72	185,444
May	28	65,578	61	180,449
April	37	87,356	82	216,312
March	42	87,056	72	208,346
February	39	89,426	71	208,388
January	36	92,194	75	235,699
December, 1925....	38	83,590	97	300,872

Los Angeles

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1926....	151	406,314	211	386,739
August	143	458,240	151	399,349
July	127	460,296	103	352,367
June	123	349,936	88	344,187
May	133	376,720	112	351,123
April	149	434,866	130	370,158
March	139	371,793	128	305,105
February	119	363,875	111	306,161
January	130	381,785	115	335,041
December	149	392,707	109	310,852
November, 1925....	181	398,459	123	337,483

San Francisco

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1926....	170	568,323	156	561,513
August	169	580,310	111	466,346
July	160	523,527	102	495,849
June	142	561,774	100	419,036
May	154	605,068	116	428,814
April	155	583,821	167	602,680
March	144	571,040	135	511,010
February	133	506,778	134	506,317
January	154	544,882	139	528,315
December, 1925....	135	532,691	153	593,556

Port Arthur

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
August, 1926.....	19	63,639	24	71,545
July	25	79,464	32	98,637
June	22	70,743	30	97,056
May	20	60,276	36	95,754
April	32	95,592	38	108,923
March	28	87,715	37	101,830
February	21	65,930	32	70,814
January	23	75,232	32	108,118
December	31	86,254	24	71,883
November, 1925....	40	117,506	42	120,597

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Late Flashes On Marine Disasters

Brief Summaries of Recent Maritime Casualties— A Record of Collisions, Wrecks, Fires and Losses

Name	Date	Nature	Place	Damage Resulting
Amazon	Sept. 23	Disabled	Off Milwaukee	Crankshaft
Anderson	Sept. 18	Ashore	Watlings Island	Floated
A. N. Osborne	Aug. 30	Aground	Soo	Not stated
Alcantara	Aug. 28	Collision	Saloum River	Damaged
Athelcrest	Aug. 30	Touched ground	Mobile	Leaking
Andromede	Sept. 5	Collision	Dunkirk	Not stated
Amberstone	Sept. 9	Aground	Kiel	Floated
Altona	Sept. 10	Ashore	Korsor	Not stated
Aleksander	Sept. 16	Aground	Faludd Island	Not stated
Amiral Jaureguiberry	Sept. 15	Collision	Rio Janero	Not stated
Aurania	Oct. 9	Collision	Grennock	Port bow
A. Cola	Sept. 22	Collision	Alboaza Pt.	Not stated
Atsuta Maru I	Sept. 23	Gale	Tokio	Broke in two
Baymead	Sept. 16	Disabled	Sambro Lighthouse	Not stated
Balsam	Sept. 25	Disabled	Moville	Steering gr.
Brask	Sept. 1	Ashore	Venice	Floated
Borde	Sept. 9	Collision	Stettin	Badly
B. L. Smith	Oct. 4	Struck pier	Duluth	Rudder; forepeak
Brierly Hill	Sept. 13	Stranded	Nygrund	Floated
Brema	Sept. 12	Aground	Riso	Floated
Belvedere	Sept. 15	Collision	Rio Janero	Damaged
Bulgarian	Sept. 16	Ashore	Dohan Aslan Bank	Floated
Byron	Oct. 5	Fire	New York	Not stated
Canadian Transport	Sept. 12	Collision	Buenos Aires	Not stated
Cedric	Sept. 12	Collision	Boston	Not stated
Charles Whittemore	Sept. 15	Ashore	Apple River	Floated; leaking
C. Russell Hubbard	Sept. 30	Collision	Lake St. Clair	Not stated
Cabo Santa Maria	Oct. 1	Fire	At sea	Not stated
Chas. Pratt	Oct. 1	Collision	New Orleans	Considerable
Calliope	Oct. 1	Collision	New Orleans	Not stated
Cassard	Sept. 3	Collision	Dungeness	Damaged
Cecil County	Sept. 5	Ashore	Boca Chica	Not stated
Charles C. West	Sept. 9	Ashore	Keweenaw Pt.	Not stated
Claus	Sept. 8	Collision	Antwerp Roads	Propeller
Caledonier	Oct. 2	Ashore	Nr. Pauillac	Floated
Cygnus	Sept. 10	Collision	Off Tilbury Dock	Port side
Cotentin	Sept. 16	Collision	Nr. Cadiz	Damaged
Christia A. Cox	Oct. 2	Sprang Leak	Off Port Moulton	Sank
Commercial Pioneer	Oct. 8	Aground	Off Eagle Point	Floated
Caledonia	Oct. 9	Collision	Grennock	Deck railing
Duluth	Sept. 22	Collision	Buffalo	Not stated
Delphine	Sept. 22	Fire	Hudson River	Total loss
Daisy	Sept. 23	Struck pier	New York	Bow
Delta	Sept. 18	Storm	Lake Worth	Wrecked
Doris Hamlin	Sept. 30	Ashore	Off Shippegan	Floated
Dafni	Aug. 30	Stranded	Kephalo Imbros	Floated
Djambi	Sept. 3	Collision	Nr. Dover	Bow; stem
Donaghmore	Sept. 8	Collision	Antwerp Roads	Not stated
Ellenia	Sept. 15	Collision	Not stated	Sank
Eastern Crown	Sept. 17	Collision	Pollock R. B. Channel	Not stated
Elterwater	Sept. 6	Aground	Stettin	Not stated
Eric Holland	Sept. 8	Collision	Lowestoft	Not stated
Elbing I	Sept. 16	Collision	Rotterdam	Not stated
Etha Rickmers	Sept. 19	Collision	Not stated	Stern
Federal	Sept. 12	Aground	River Thames	Floated
Florence	Sept. 24	Fire	New York	Engin room
Franklin	Sept. 16	Collision	Houston Ship Channel	Not stated
Felipe	Sept. 3	Collision	St. Catherine's Pt.	Sank
Flanders	Sept. 15	Collision	River Scheldt	Rudder
Forelle	Sept. 15	Struck	Bremen	Broke in two
Genoa	Sept. 14	Struck obs.	Detroit	Ashore
Gaston	Sept. 27	Aground	Mystic River	Not stated
Glava Glasbruk V	Sept. 2	Stranded	Anholt	Floated; bottom
Ganges	Sept. 6	Collided quay wall	Havre	Plates; frames
Gunlog	Sept. 15	Ashore	Malmo	Not stated
Gesine	Sept. 14	Collision	Hamburg	Badly
Gronland	Sept. 21	Disabled	Copenhagen	Stern tube
Hazel Trahey	Sept. 9	Abandoned	St. Johns	
H. C. Frick	Sept. 23	Ashore	Point Aux Pins	Floated
Houma	Sept. 21	Fire	Harvey Canal	Sank
Hanover	Sept. 28	Disabled	Honolulu	Machinery
Handicap	Sept. 28	Collision	Columbia River	Damaged
Hesbaye	Aug. 28	Collision	Saloum River	Plates
Hcian Maru	Aug. 28	Gale	Off Saghalien	Sank
H. H. Rogers	Oct. 4	Struck Bridge	Lorain	Plates
Harpalion	Sept. 14	Ashore	Gulfport	Not stated
Induna	Sept. 15	Collision		Badly
Iside	Aug. 31	Collision	Antwerp Roads	Not stated
Imperial	Sept. 15	Stranded	Gunboat Passage	Floated
Igotz Mendi	Sept. 23	Aground	Long Reach	Floated
Josiah B. Chase	Sept. 25	Aground	Smiths Point	Floated
Jiul	Sept. 2	Aground	Sulina	Floated
John Stanton	Sept. 13	Disabled	Lime Island	Propeller
John and Mary	Oct. 6	Struck rock	Horton's Point	Bow
J. B. Llovera	Sept. 22	Collision	Off Alboaza Pt.	Sank
Kiowa	Sept. 11	Aground	Acklin Islands	Floated
Kalfarli	Sept. 30	Aground	Willamette River	Floated
Kashima Maru	Aug. 31	Stranded	Off Chikuzen Province	Sank
Koning Albert	Sept. 8	Collision	Lowestoft	Damaged
Kostantis Lemos	Sept. 8	Fire	Hull	Not stated
Kingfisher	Sept. 10	Collision	Off Tilbury Dock	Not stated
Kaikyu Maru	Sept. 9	Stranded	Helmoken Island	Bottom
Koyo Maru	Sept. 13	Fire	Tokio	Considerable
La Savoie	Sept. 14	Collision	W. of Ireland	Not stated
Loyal Citizen	Sept. 14	Hurricane	Off Bermuda	Sank
Lillan	Sept. 14	Aground	Par	Not stated
Lio	Oct. 7	Collision	Off Stapleton	Bow plates
Miron L.	Sept. 12	Collision	Off St. Jean	Bow
Melrose	Sept. 19	Grounded	Pollock Rip	Steering gear; f. p.; bot.
Modig	Sept. 17	Disabled	Off Nova Scotia	Steering gear
Mary O'Connor	Sept. 21	Fire	So. of Cape Sable	Abandoned
Manchester Spinner	Sept. 20	Aground	Orignaux Point	Floated
McKeesport	Aug. 30	Aground	Chesapeake	Not stated
Macapa	Sept. 1	on rocks	Nr. Monsuba Pt.	Floated
Morgalau	Aug. 31	Collision	Antwerp Roads	Port side
Markakis	Sept. 3	Aground	Nicolaieff River	Not stated
Martinique	Oct. 5	Collision	Nr. Reedy Island	Stem; plates
New Britain	Sept. 30	Fire	Georgia	Considerable
Northland	Sept. 20	Disabled	San Francisco	Propeller
Neerlandia	Sept. 13	Collision	Pegwell Bay	Considerable
New Dawn	Oct. 1	Ashore	Storkmals Island	Keel
Nova Queen	Oct. 6	Ashore	Shovelful Shoal	Floated
Oregonian	Sept. 28	Collision	Columbia River	Damaged
Orvieto	Sept. 16	Aground	Port Said	Floated
Oostcapelle	Sept. 15	Aground	Fort Phillip	Floated; bottom
P. W. Sherman	Sept. 14	Ashore	North Point	Floated
Pan America	Sept. 1	Collision	Montevideo	Not stated
Polydorus	Sept. 14	Collision	Hamburg	Not stated
Persia L.	Sept. 16	Fire	Bombay	Not stated
Pearson	Oct. 11	Aground	Detroit River	Floated
Paris	Oct. 7	Collision	Havre	Not stated
Rio Claro	Sept. 14	Ashore	Cairns	Not stated
Robin Gray	Sept. 15	Fire	Southport	No. 2 hold
Rebecca R. Douglass	Sept. 17	Collision	Pollock Channel	Bow
Romney	Sept. 1	Collision	Montevideo	Not stated
Reijnst	Sept. 12	Fire	Medan	Considerable
Roseway	Sept. 14	Sank	Wolfville	
Rafail Archangel	Sept. 16	Collision	Nr. Cadiz	Damaged
Sachem	Sept. 15	Collision	River Rouge	Considerable
Santa Tecla	Sept. 17	Ashore	Guayaquil	Floated
S. F. B. Morse	Sept. 24	Ashore	Detour reef	Floated
Steelvendor	Sept. 30	Collision	Lake St. Clair	Not stated
Storfjeld	Sept. 20	Ashore	Off Cape Chat	Floated
San Jacinto	Sept. 16	Collision	Houston Channel	Considerable
Swallow	Aug. 31	Collision	Bay of Biscay	Damaged
Stromboli	Aug. 31	Collision	Bay of Biscay	Not stated
Solitaire	Aug. 30	Collision	Tampa Harbour	Not stated
Schulte	Sept. 9	Collision	Stettin	Badly
Sakurajima Maru	Sept. 9	Aground	Osaka	Floated
Suzon	Oct. 5	Collision	Brest	Sank
Sunray	Oct. 8	Ashore	Nuevitas	Floated
Seventy	Sept. 17	Hurricane	Palm Beach	Wrecked
Tracy Bros.	Sept. 23	Disabled	New Orleans	Engine; turbine
Tuxpanoil	Sept. 28	Canal bank		Leaking badly
Trojanstar	Sept. 30	Ashore	Point Wilson	Not stated
Tampa	Aug. 30	Collision	Tampa Harbor	Bow
Takasago Maru	Sept. 2	Fire	Osaka	Nos. 1 and 2 hold
Teseo	Sept. 8	Collision	Palermo	Plates; frames
Thorsteinn	Sept. 15	Collision	Reykjavik	Damaged
Thorpe Grange	Sept. 23	Aground	River Parana	Not stated
Utah	Sept. 11	Ashore	Punta San Juan	Total loss
Van	Sept. 12	Collision	Boston	Starboard side
Virginia Dare	Sept. 16	Hurricane	Nr. Manuabo	Ashore; floated
Vaarli	Sept. 25	Collision	Off Tomkinsville	Plates
Versailles	Sept. 27	Hurricane	Off Lunenburg	Considerabe
Volumnia	Sept. 3	Collision	Nr. Dover	Ashore
Vulcan	Sept. 8	Fire	Sacramento River	Total loss
W. F. White	Sept. 15	Aground	River Rouge	Floated
William A. McKenney	Sept. 14	Aground	Columbia River	Floated
W. F. White	Sept. 29	Aground	Toledo	Floated
West Quechee	Sept. 22	Disabled	Falmouth	Turbine
Winona County	Sept. 18	Fire	St. John	No. 2 hold
Wilhelm A. Riedemann	Oct. 3	Disabled	Fort Morgan	Engine
Walter Holken	Sept. 10	Aground	Brunsbuttelkoog 77	Not stated
Wabana	Sept. 13	Collision	Nr. Montreal	Port side
Westlea	Sept. 16	Collision	St. Catherine's Pt.	Bow; plates
William E. Litchfield	Oct. 9	Collision	Not stated	Bow
W. A. Reiss	Oct. 12	Ashore	Southeast shoal	Floated
Wellesley	Oct. 10	Ashore	Flavel	Waterlogged
Yalou	Sept. 19	Collision	Not stated	Bows
Zillah	Aug. 30	Sprang Leak	Off Whitefish Pt.	Sank

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Franklin D. Mooney

(*Continued from Page* 62)

S. A. (New York and Tampico); Cuban American Terminal Co., Cuban Navigation Co., International Shipping Corp., New York & Porto Rico Steamship Co. (of Maine), The New York & Porto Rico Steamship (of New York), San Antonio Co., San Antonio Docking Co., Santiago Terminal Co., United States & Porto Rico Navigation Co., New York & Cuba Mail Steamship Co.

Mr. Mooney is a great believer in good terminals, conveniently located and fitted with facilities which permit the loading and unloading of cargo with the least expenditure of time and expense. The company's terminals at Charleston, Jacksonville, Tampa, Key West, Miami, San Juan, Porto Rico, Havana and Santiago have recently been rebuilt, and greatly improved. He also consistently favors the building of vessels of the highest type for both freight and passenger traffic, paying particular attention to every modern development for promoting the safety and comfort of passengers.

In promoting foreign trade routes he believes that American shipping will profit most by developing within itself the highest basis of efficiency, and that within the industry the companies which invest money in men of highest intelligence are entitled to success.

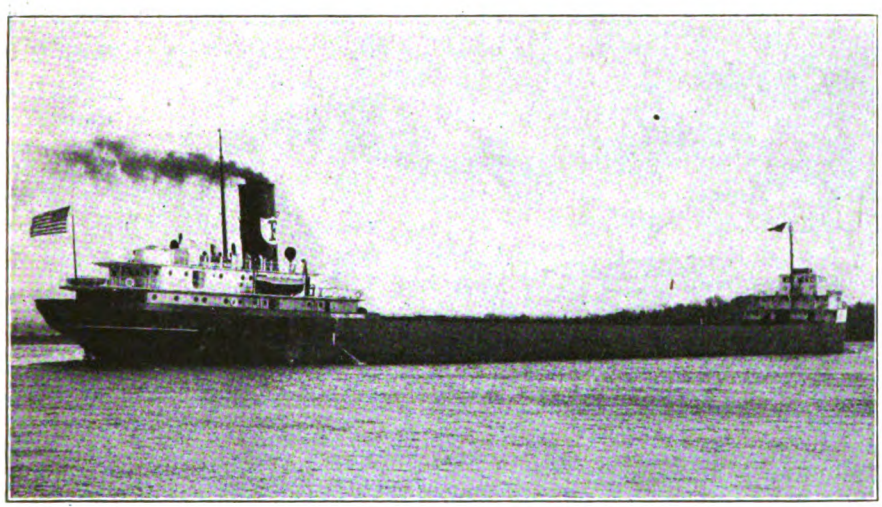
A steady, well-balanced disposition characterizes Mr. Mooney's conduct generally. His associates attribute to him the qualities of patience, tact and understanding. He is even-tempered and is able to get things done without friction. He has a genial personality, colored by a keen sense of humor. A hard and thorough worker himself, he expects the same kind of co-operation from his associates and receives it. He is known for the recognition he extends to those who show merit in the company's employ. He displays a caution founded on complete preparation for anything he has to say or do.

Mr. Mooney has his residence at Garden City, Long Island. His principal recreation is golf. He is an enthusiast over this sport and does most of his playing at the Cherry Valley Golf club. He is also a member of the New York Yacht club and the Whitehall club. He takes methodical care of his health. He spends much time in reading. He is a home-lover and takes part in the activities and interests of his family, consisting of his wife, son and daughter.

Cut Fuel Bill on Great Lakes Freighters

By Using Turbines, High Pressure Steam and Powdered Coal

BY EDWIN B. SADTLER



Edward J. Berwind—Franklin Steamship Co.

Cutting down the fuel bill without sacrifice of other essential factors is what every ship operator wants. The author with a thorough understanding of ships and their machinery bred of long practical experience in their design and construction suggests in the accompanying brief analysis certain departures from common practice on the Great Lakes. His conclusions are that slightly more cargo could be carried in the same time at a saving of over 1900 tons of fuel in one season for a ship of this type.

PRESENT great Lakes bulk freighters of the E. J. Berwind type make 12 statute miles per hour or 10.4 knots on 2350 indicated horsepower, carrying 11,000 tons of cargo, and making the round trip of 1650 miles in seven days.

These ships apparently have the extremely full block coefficient of 0.875. Their usual run gives them 30 trips per season. Were ships of this type reduced to a block coefficient of 0.83 and their power increased to 2700 horsepower or an increase of less than 15 per cent, they would be able to make a speed of 13 miles or 11¼ knots. The time for the round trip would then be six days, or 35 trips in the same period of time.

The cargo carried in present ships per vessel would be 11,000 × 30 = 330,000 tons. For the proposed ships it would be 9500 × 35 = 332,500 tons. The finer modeled ship would be much safer in bad weather and when running light one way as is frequently done would be much more efficient.

While the data at hand shows these ships to be using 1.66 pounds of coal per indicated horsepower or 8300 tons for the season, this could be greatly improved by using higher steam pressures with turbines and powdered coal fuel which would bring down the fuel consumption to at most one pound per shaft horsepower or 0.9 pound per indicated horsepower per hour, giving a total of 6370 tons for the season, thereby showing a saving of 1930 tons while at the same time carrying a total of 332,500 tons of cargo.

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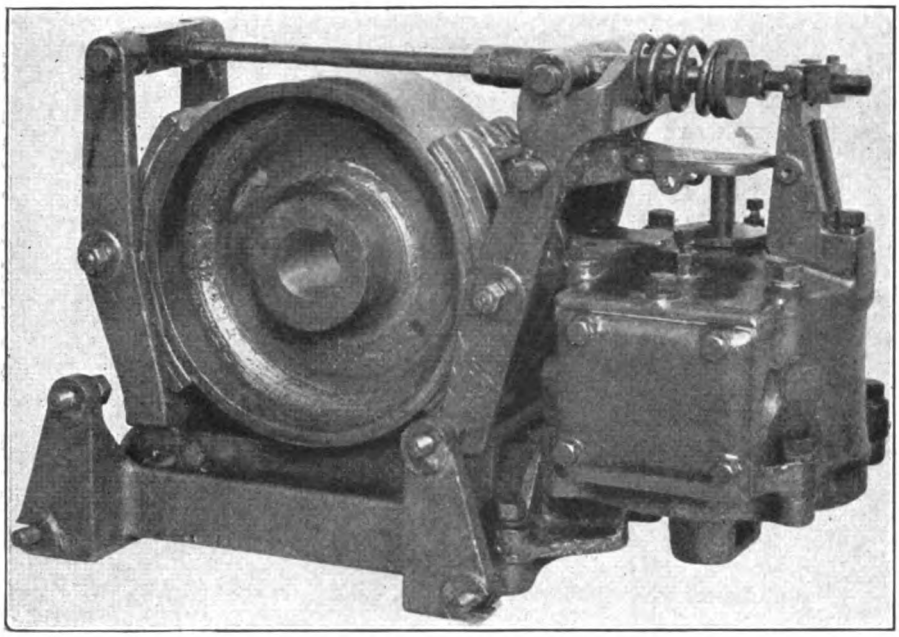


SERIES TYPE SOLENOID BRAKE FOR MARINE SERVICE

Electric Auxiliaries

(*Continued from Page* 54)

Regarding the proper selection of auxiliary apparatus, this naturally leads to comparison of the operating and maintenance charges of the electric versus other systems. The influencing factors are the type of ship, trade route, dock facilities at ports of call, type of cargo handled and percentage of time the apparatus is in use. It is probably not good economy to build an expensive house in a cheap neighborhood, nor a cheap house in an expensive neighborhood, and the same is true in regard to the selection of auxiliary equipment.

It is not always clear where this dividing line takes place, and especially difficult to generalize, unless all the factors are known. Without drawing the line of division too closely, or too explicitly, we may say that the motorship presents one of the most excellent fields for complete electrification. The elimination of the boiler plant entirely and the dual use of the auxiliary generating plant in furnishing power for engine room auxiliaries at sea, and the deck auxiliaries in port, give the highest combined efficiency obtainable. Complete auxiliary electrification has become standard practice in new motorship construction and has been one of the primary factors leading to the great development of electric auxiliaries the past few years.

In spite of the above facts, a few steam vessels, which have been reconditioned to motorships have installed electric engine room auxiliaries throughout, but have retained a part of the boiler plant to take care of the deck auxiliaries. Complete electrification in the above cases is but a logical step forward and generally fuly justified from an economic standpoint.

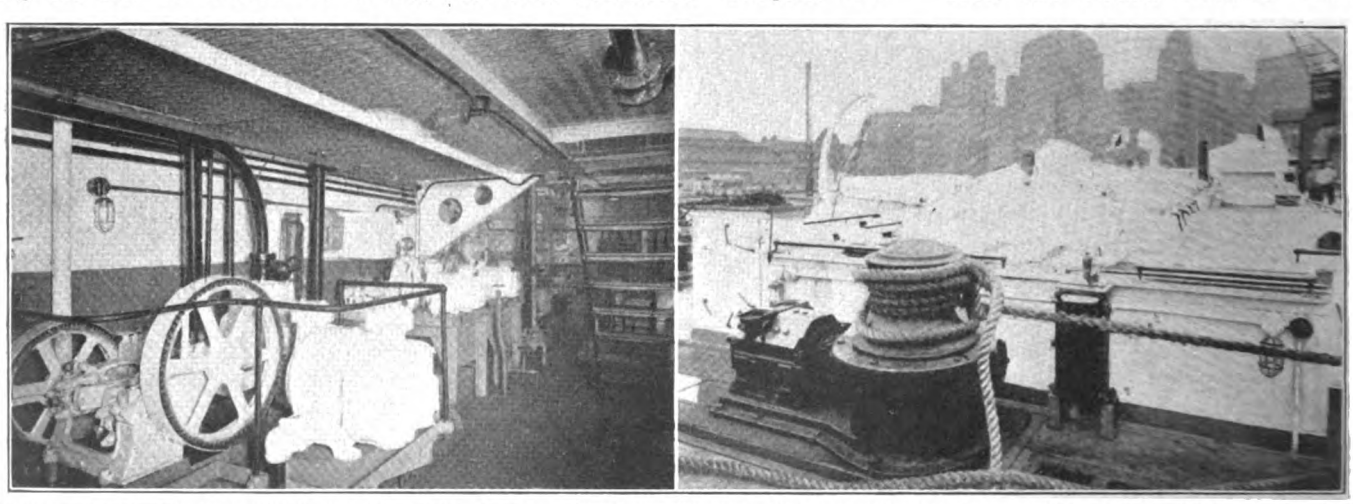
The justification of electric deck auxiliaries on steam vessels is a debatable subject with the weight of argument favoring electrification. From an economic point of view, the lines are not as clearly drawn as on the motor vessel; ships must be studied under existing conditions, present losses determined and analyzed, and a determination made of how the overall economies may be increased and accomplished electrically. The results will be different on various classes of ships and will also be affected by the trade route, time at sea, time in port, and type of cargo handled. As a general rule, on steam vessels handling cargo and working the coastwise trade, the electric auxiliaries are easily justified, because of the high percentage of time the equipment is in service.

The problem also involves the electrification of the engine room auxiliaries as well, and should be studied jointly in order that the dual use may be made of the generating equipment and the benefits of continuous operation derived.

Deck Auxiliaries and Their Problems

The principal deck auxiliaries subject to electrification consist of the anchor windlass, capstan, warping winches, gypsies and cargo winches; and on special types of ships—towing machines, and boat hoists. Each presents a problem of its own and in order that a clear idea may be gained as to how the problems have been met electrically, a short description of the apparatus involved and its characteristic duty will be given.

There are certain features which



DIESEL ELECTRIC MOTORSHIP TWIN PORTS—LEFT—GENERAL SERVICE PUMP IN FOREGROUND, LUBRICATING OIL PUMP AND TRANSFER PUMP IN BACKGROUND, ALL DRIVEN BY DIRECT CURRENT MARINE TYPE MOTORS—RIGHT—CAPSTAN DRIVEN BY A 15-HORSEPOWER, 1000 REVOLUTIONS PER MINUTE, 230-VOLT DIRECT CONNECTED MARINE TYPE MOTOR CONTROLLED BY A WATERTIGHT CONTROLLER AND PROTECTIVE PANEL (BELOW DECK)

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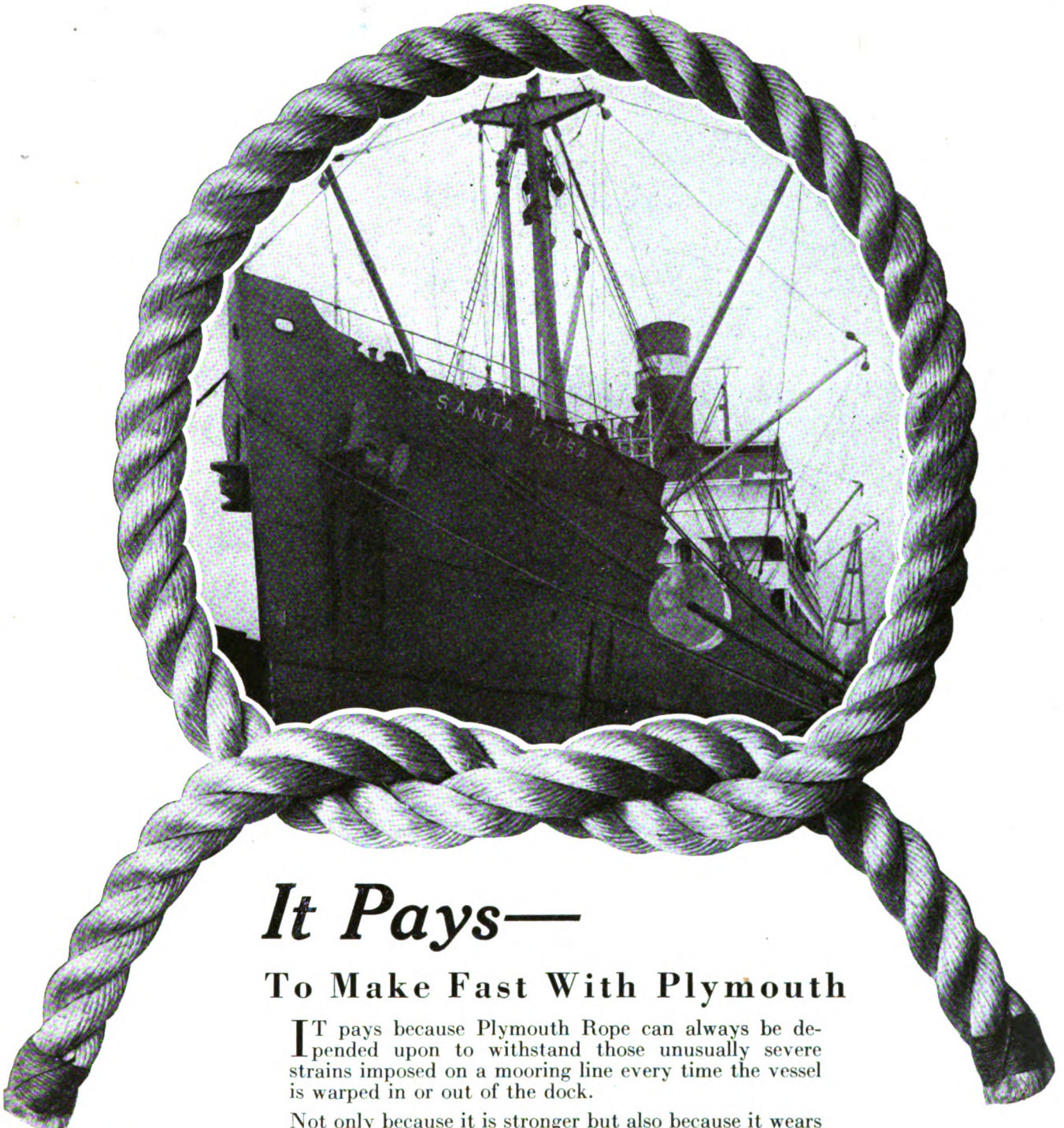

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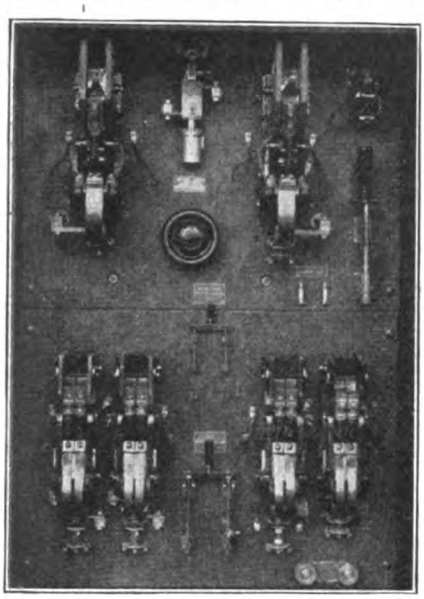
it is desirable to incorporate in the design of the electric equipment for anchor windlasses, due to the nature of the loads handled, and, which may at times reach an overload value sufficient to stall the motor. Electrically, this is provided for by an automatic current limiting device (step-back), which enables the motor to stall and hold tension on the lines or anchor chains. Although this point of current limitation is an arbitrary point and may be set for any given overload desired, it is usual practice to allow for 125 per cent full load torque with the motor armature at standstill. As the momentary overload is relieved,



MAGNETIC CONTROL PANEL FOR UNDER DECK AUXILIARIES

the motor again automatically starts up and continues to haul in.

The nature of the work performed by capstans, gypsies and warping winches, such as warping a ship into dock, the handling of heavy lines or miscellaneous hositing duty, calls for a relatively slow speed, generally not over 50 feet per minute at full load. The tendency in design is to provide rheostatic control with step-back arrangement to take care of overloads, smiliar to that used for anchor windlasses.

For rapid economical cargo handling, the electric cargo winch is supreme. Equipment has been designed to take care of the most extreme conditions as to load, rope speed and tonnage capacity. From an operating standpoint, such equipment has been made fool-proof.

As the largest part of the cost of loading and unloading vessels is the labor cost, the tendency is to design the equipment for such rope speeds and capacity as to keep the stevedores busy under all conditions. The special features included in the most up-to-date equipment, provide for automatic acceleration, automatic retardation and dynamic braking. An electric holding brake of the automatic solenoid type is also provided so that at all times when the controller is in the "off" position, the brake is set, also at any time when the current fails. Overload circuit breakers are also provided which automatically reset when the controller is brought back to the "off" position.

From an operator's point of view, the operations are extremely simple and the stevedore familiarizes himself with the equipment much more rapidly than with steam equipment.

As electric machinery requires no warming-up or expenditure of power, except when actually working a load, and no time is lost in getting the equipment into working order after the ship is docked, it is rapidly coming into favor. Even on types of ships in which a calculated analysis might show steam and electric equipment to be about on an economic par, there are many intangible features which favor the electric drive and which are only brought out by direct comparison or observation over long periods of service.

Electric Winches, Reliable

(*Continued from Page* 60)

the load is light or heavy and use a manual brake for lowering. These did not prove very successful and helped to establish 230-volt direct current as being best suited for cargo winch control. Immediately following, came the successful installation of electric winches on the motor ship WILLIAM PENN. The mechanical portions of these winches were built by the American Engineering Co. and the electric parts by the Westinghouse company. While there were a number of other electric winch installations by this time, including some reported reasonably successful, most of them represented an attempt to adapt to land service equipment by adding marine fittings, water tight gaskets, etc. The WILLIAM PENN winches illustrated the advisability of furnishing equipment built for marine service from the ground up. These winches are heavily built with a 30-horsepower, 75-degree centigrade mill type motor driving the drum through a two-speed double-reduction of spur tooth gearing.

This design followed the "safety first" plan of a very heavy winch with change speed gearing because it was not definitely known how flexible the electric motor driven winch would prove to be or what load and speed ranges it would have to meet. The success of the lighter single speed reduction winches as installed on the motor ships SUPHENCO and CHALLENGER, has been so marked that practically all the recently designed ships use that type rather than the heavy two speed type as on the WILLIAM PENN. The lighter winches are all of the positive drive single keyed drum type with rheostatic control for hoisting and dynamic braking control for lowering. There are a number of winches of special design including one with mechanical load lowering brake, the hydraulic speed gear drive winch, and the friction drum winch. But none of these have as yet been installed on American ships in sufficiently large numbers to

(*Continued on Page* 86)

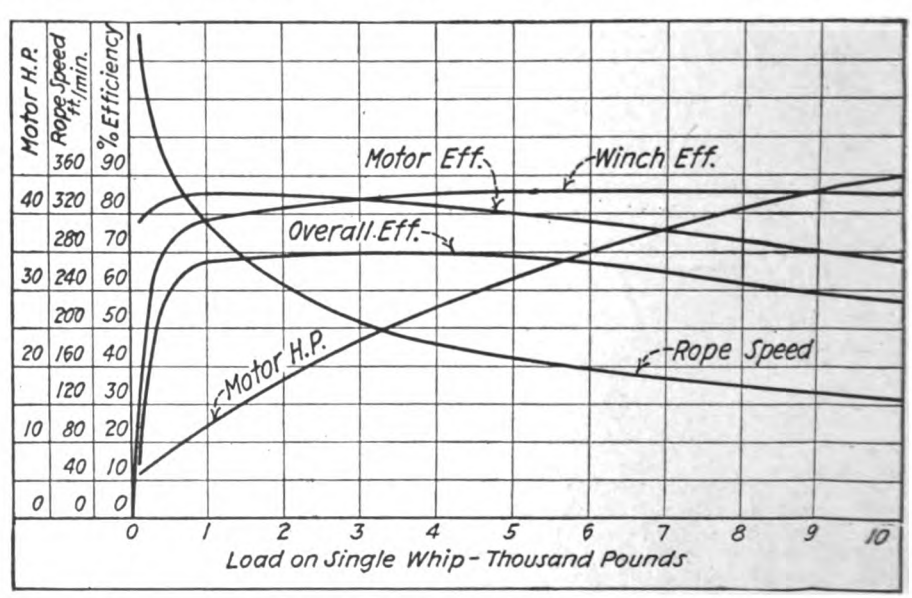


FIG. 3—CHARACTERISTIC CURVES FROM BRAKE TEST OF CARGO WINCH ILLUSTRATED IN FIG. 2

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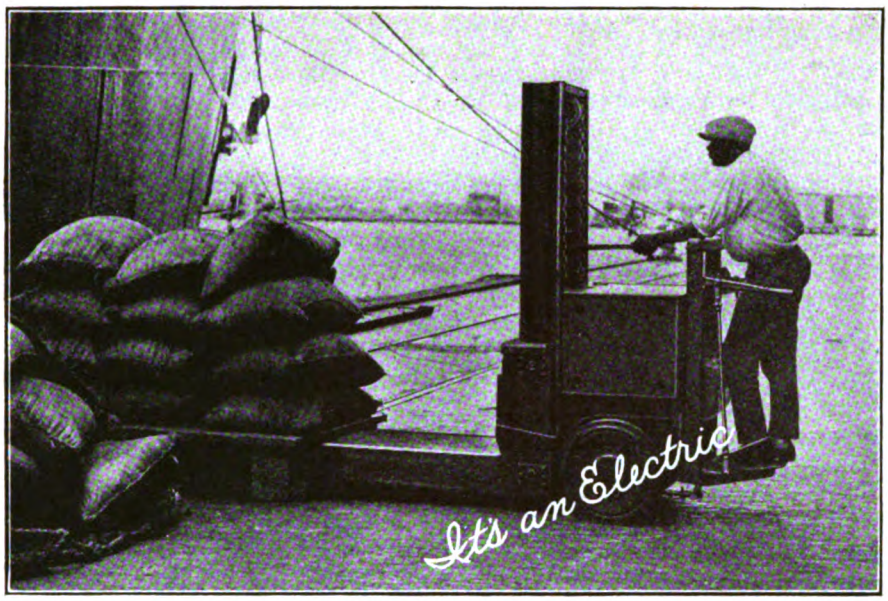


Electric industrial trucks and tractors that move fast in the afternoon can make the necessary trips to handle cargo—a factor that cuts handling costs. Many truck users have found that they can get good speed out of their trucks all day long. Read how they have done it.

Keeping your "electrics" moving fast *all day*

To keep down handling costs, it is important that they keep up a good speed during the afternoon

HUNDREDS of electric industrial truck and tractor users find that their machines keep moving fast right down to the end of the day's work. They maintain, to a marked degree, the pep and speed of the morning.

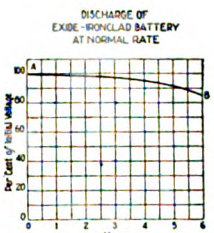
These trucks are equipped with Exide-Ironclad Batteries. Exide-Ironclads maintain a good rate of speed *all day long*. With one of them in the battery box, a truck can easily handle the required day's work and still get back to the charging panel at quitting time.

In addition to its speed, the Exide-Ironclad has abundance of power. And it can deliver this power at many times the normal discharge rate when necessary.

Steep ramps, rough surfaces or extra-heavy loads bother this battery very little. It simply delivers power faster—and breezes ahead.

On the other hand, repairs play a very small part in the life of the Exide-Ironclad. It is built so rugged that it stands up under hard service with hardly ever a trip to the shop. This, plus the fact that it is economical on charge, means a large saving on maintenance, for the life of the Exide-Ironclad is unusually long.

If your trucks and tractors are not already equipped with Exide-Ironclads, it will be worth your while to send for our booklet, "Facts for consideration in selecting a Storage Battery," Form No. 2865, and learn all the advantages of this economical and efficient battery.



Speed up your "electrics" with Exide-Ironclad Batteries. This chart shows that they maintain a high voltage throughout the entire day's operation.

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Great Lakes Levels

(*Continued from Page 59*)

lost from the lakes by evaporation. A hot, dry summer with high and persistent winds will result in an abnormal loss, difficult however to calculate. It is probable that this cause has contributed to some extent to the low levels in recent years.

3. A third cause of general changes in the elevations of the lakes is the uneven rate at which the rainfall reaches these bodies of water. Generally speaking the precipitation over the Lake region is heavier in summer than in winter; this is particularly the case in the western districts. Even if the rainfall for an entire year is about normal there are always months, or series of months, in which it will be above or below normal. During the long winter of this northern region much of the precipitation is held back on the land in the form of snow and ice, while ice and ice jams diminish still further the flow of incoming streams and outgoing waterways. From all these causes it results that during the course of each year the lake levels are subject to a consistent seasonal rise and fall which usually reaches its lowest stages during the winter months and its highest during the summer months. The extent of this annual fluctuation varies greatly from year to year: the minimum ever recorded ranges from 0.53 foot on Lake Superior to 0.87 foot on Lake Erie, while the maximum runs from 1.94 feet on Lake Huron to 3.65 feet on Lake Ontario.

Wind has Temporary Effect

4. The fourth cause of change in lake levels, and the one which produces the greatest temporary and local changes, is the action of the winds. When these blow over any lake long enough and with sufficient velocity to drive the surface water forward in greater volume than is carried by the lower return current, there is a raising of the elevation of the water on the lee shore and a lowering of it on the weather shore. This effect is most pronounced on Lake Erie, because it is the shallowest of the Great Lakes and affords the poorest opportunity for the impelled upper waters to return through reverse currents beneath the depth disturbed by a storm. As a result, strong westerly winds pile up the water in Buffalo harbor at the eastern end of the lake, while easterly winds drive it out and lessen the depth and hence the flow of the Niagara river. The effect seldom lasts more than twelve hours but it has raised the water in the harbor as much as 9.7 feet above the adopted datum plane, and lowered it as much as 3.5 below that plane. It has quite often happened that the highest and lowest stages of water recorded in any month have occured on the same day, or only a few days apart.

On the other hand, the winds produce exactly the reverse effect at the western end of Lake Erie, where the harbors of Sandusky and Toledo are particularly affected. In the latter the observed wind-produced fluctuations, in combination with the prevailing water stage, range between extremes of 9 feet above to 6.5 feet below datum.

The wind fluctuations on the other lakes are less pronounced, though they are materially augmented in bays and at the lake extremities where the impelled water is concentrated in a restricted space by the converging shores, and sometimes by a gradually sloping bottom. On Lake Superior the wind-produced changes may amount to as much as 2 feet in violent storms but seldom exceed 1 foot above or below normal level. Green Bay harbor on Lake Michigan and Saginaw harbor on Lake Huron are instances of bays where wind effects are strongly felt.

5. A fifth cause, resulting in temporary changes of lake levels, is the variation in barometric pressure. These variations cause at times oscillations (known as seiches) in the water surface ranging from a few inches to several feet and return to normal within a few hours. These seiches are as a rule neither of large amount nor of sudden occurrence on Lake Erie.

6. The sixth cause includes the artificial conditions—those produced by man and not as in the preceding cases by nature—which affect lake levels.

The best known of these is the diversion through the Chicago sanitary drainage canal of an amount of water from Lake Michigan, which has averaged 8660 cubic feet a second for the last five years. Accord to the latest computations this is estimated to have caused a lowering of the level of Lake Michigan of between six and seven inches, and is more than double the amount of diversion that was authorized in a temporary permit granted by the secretary of war in 1901. After many years of litigation the government in 1925 secured a final decision from the Supreme Court compelling the sanitary district of Chicago to comply with the regulations of the war department, and that department at once took active steps which will result in reducing the amount of diversion as rapidly as due regard for the health of the citizens of Chicago will allow. As previously stated, Lake Michigan in August, 1926, was 1.96 feet below the average August stage of the last ten years. Of this 23½-inch fall, the Chicago diversion at its recent rate of flow (which is about 8250 second feet) may be held responsible for about 6 inches—an amount of great importance to lake commerce when the levels are as low as during recent years.

Another important artificial cause is the sluice gates and dikes erected jointly by the United States and Canada in the St. Marys river at the head of the falls by which the volume of the outflow from Lake Superior is regulated. In order to prevent this lake from falling so low as to interfere with navigation, some of the water that would ordinarily have flowed into the lower lakes has been held back at times, thus adversely affecting the levels of these lakes.

Compensate for Deepened Channels

Deepening of the connecting waterways between the lakes might have had an important influence on their levels but it has been almost, if not entirely, compensated for by other works. It is not believed that the cutting down of the forests on their shores has diminished the amount of water reaching the lakes.

It may be noted here that tides, the chief cause of water fluctuations in our coast harbors, have no perceptible effect on any of the Great Lakes.

As for the future, since no man can foretell what vagaries will accur in the precipitation over the lake region in the next few years, no accurate prediction is possible. However, as in the past periods of low water have always been followed by periods of high, it is only a question of time before the lakes begin to rise from their present low stage. It is quite possible that this season may see the turn of the tide. It is at least an encouraging sign that in August all the lakes, except Superior (which is artifically regulated) are slightly higher than they were a year ago, the first month in which this has accurred for several years.

As already stated, the level of Lake Superior is now regulated by works built at its outlet. The feasibility of controlling the levels of Lake Michigan, Huron, Erie, and Ontario by

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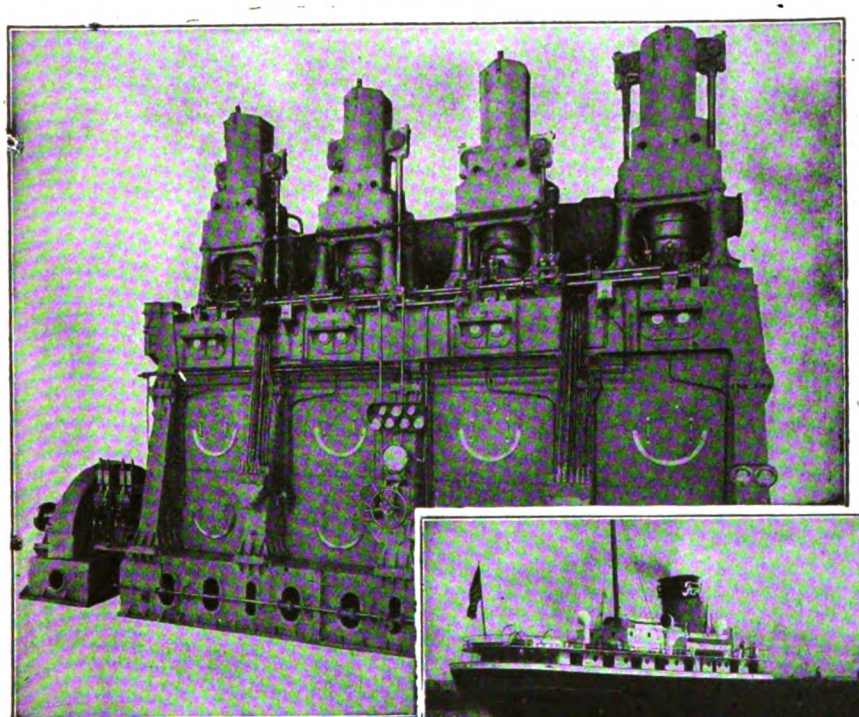
SUN SHIPBUILDING & DRY DOCK COMPANY

Builders of

SUN-DOXFORD DIESEL ENGINES

The Engines that Power

"HENRY FORD II" *and* "BENSON FORD"



3000 S. H. P. Sun-Doxford Diesel Engines power the two motor-ships, "Henry Ford II" and "Benson Ford".

M. S. "Henry Ford II"

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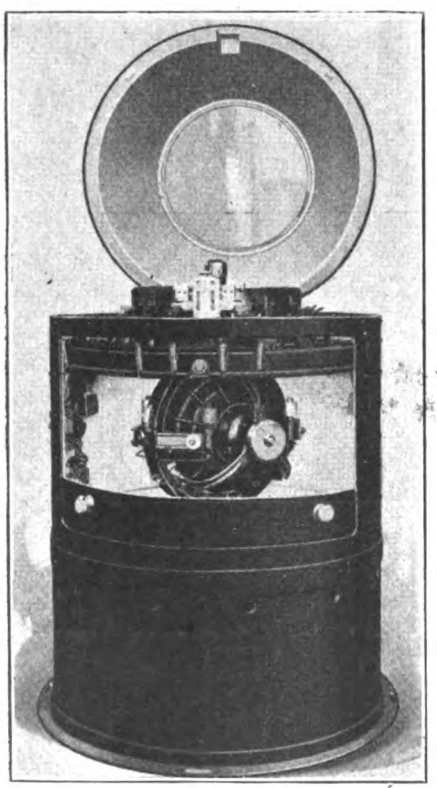
works similarly placed has been much discussed and is now being carefully investigated by a joint board of engineers oppointed by the United States and Canada. It is expected that their report will be submitted within the next few months, and that it will contain most valuable information on this subject.

Control on Bridge

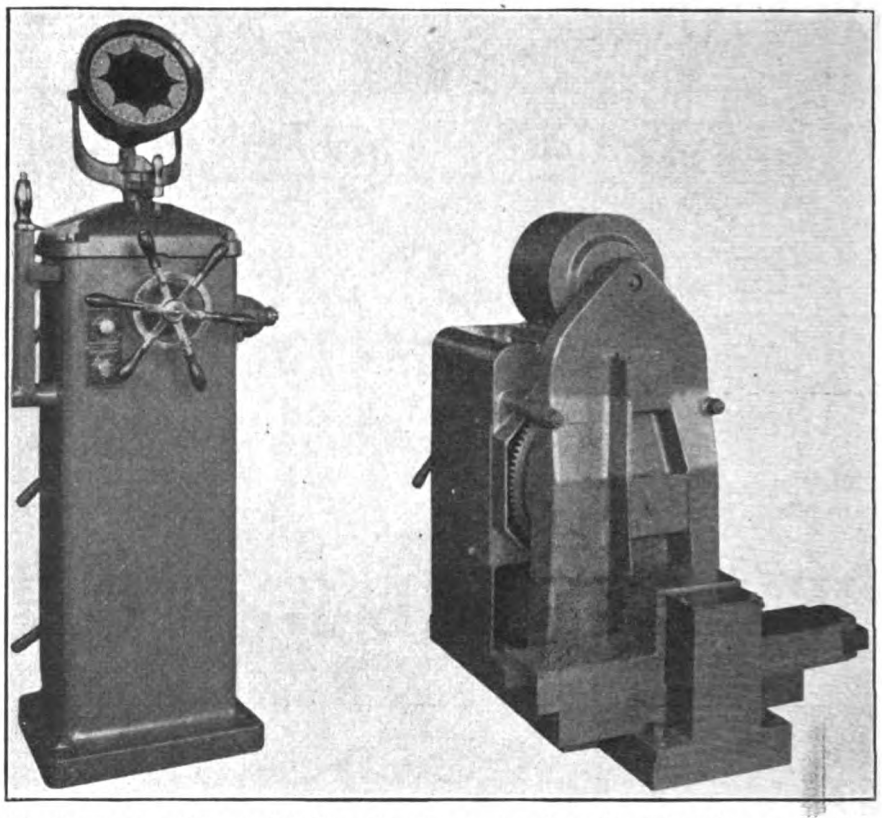
(*Continued from Page* 63)

should be available on the bridge. Althought some merchant ships had been equipped with a form of helm indicator, particularly for use in harbor or other restricted water work, this seemed to be the first tangible evidence of the all around advantages of such an indicator. The machine does not need such an indicator any more than does a man at the wheel, but the machine is so definite and uniform in its action, that the advantages of the helm angle indicator show up at once.

What are the engines making? That is a question often asked on the bridge, as it vitally affects the accuracy of navigation. Sitting comfortably behind the wheel of a car, we have only to glance at the dashboard to see the speed over the ground. This is not so easy on ship board, but it is just as easy to show the engine speed, which is a function of the ship's speed. Many ships are now provided with engine speed indicators which show the revolutions per minute of the engines and whether they are running ahead or astern, and also the total revolutions, all on an indicator in the wheel house.



MASTER GYRO-COMPASS WHICH IS THE CENTER OF A COMPLETE NAVIGATING SYSTEM—INDICATING REPEATER COMPASSES ARE OPERATED BY MEANS OF THIS MASTER COMPASS AT VARIOUS STATIONS ON BOARD SHIP



The Sperry gyro-pilot operated from the gyro compas steers the ship with accuracy—Three methods of steering—hand, controller and automatic—By moving lever on left of the steering unit anyone of these methods may be used

Searchlights can now be located at any desirable point on the ship, and be operated conveniently from the bridge through an electrical control system that is simple and durable. It is generally known that a searchlight operator or one who stands near a searchlight has the poorest chance of seeing the object which he is endeavoring to illuminate, because he is compelled to look through the length of the beam. A sturdy and reliable distant electric control is therefore of great aid, as the searchlight may be located at the most desirable point regardless of its accessibility to the bridge.

There are many other developments which have aided in centralizing the management of the ship on the bridge such as the telephone, the submarine signal, the loop type radio direction finder, depth sounding equipment, etc. The diesel-electric drive is even bringing the manipulation of the main drive motors directly on the bridge. On the M. S. J. W. VAN DYKE the chadburns operate control resistances which start, stop, reverse or change the speed of the main drive motor instead of signalling the engine room for the operators there to handle the controls.

Orders Placed

Early in October Delaware shipyards were bidding on a seagoing steel dredge for Dalkowitz Bros., New York. About 1000 tons of steel was involved.

The Reading railroad has placed an order with the American Brown Boveri Electric Corp. for four lighters. The Gulf Refining Co. recently placed an order for two oil barges with the American Brown Boveri Electric Corp. and two similar barges with the Sun Shipbuilding company each barge containing about 300 tons of steel.

Dredging Machinery

Sand and dredging pumps and hydraulic dredging machinery manufactured by the Morris Machine Works, Baldwinsville, N. Y., are illustrated and described in a bulletin by that company. It is profusely illustrated by halftones of pumps and dredges at work in various localities and for varied purposes. Descriptions and specifications of the pumps, with much engineering data, are given.

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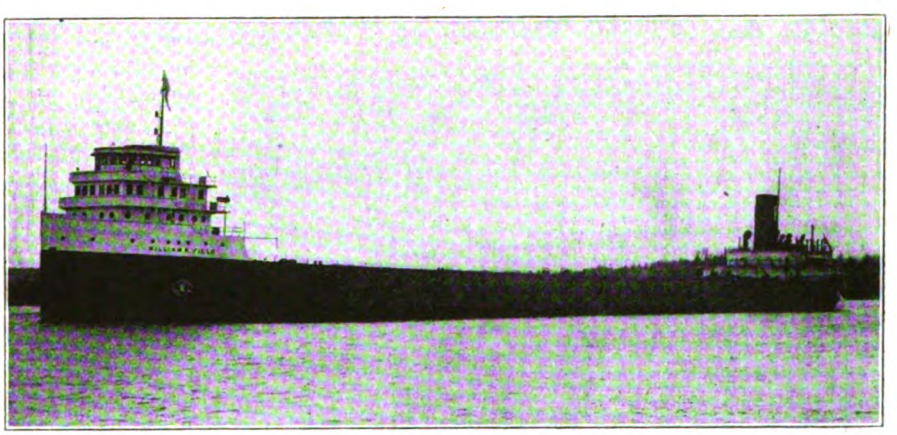
Toledo Shipbuilding Company Inc.

TOLEDO - - - OHIO

Builders of the World's Record Cargo Ship



Steamer William K. Field

604 ft. Long, 60 ft. Beam, 32 ft. Depth. Deadweight Tonnage 12000.

OVER half a million tons of freight carried—forty six cargoes of ore and coal delivered in seven months and seventeen days by the steamer William K. Field.

This remarkable performance earned her the title, "Champion Freight Carrier of the World". During the season 1924 on the Great Lakes she registered a total of 552,014 tons. *An unprecedented accomplishment!*

The William K. Field is owned and operated by Reiss Steamship Company, Cleveland, Ohio. Her type of construction permits rapid loading and discharge of cargo. This was an important factor in her record breaking performance.

Builders and Repairers of Ships and Engines

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Oil Purifiers Needed

(*Continued from Page* 65)

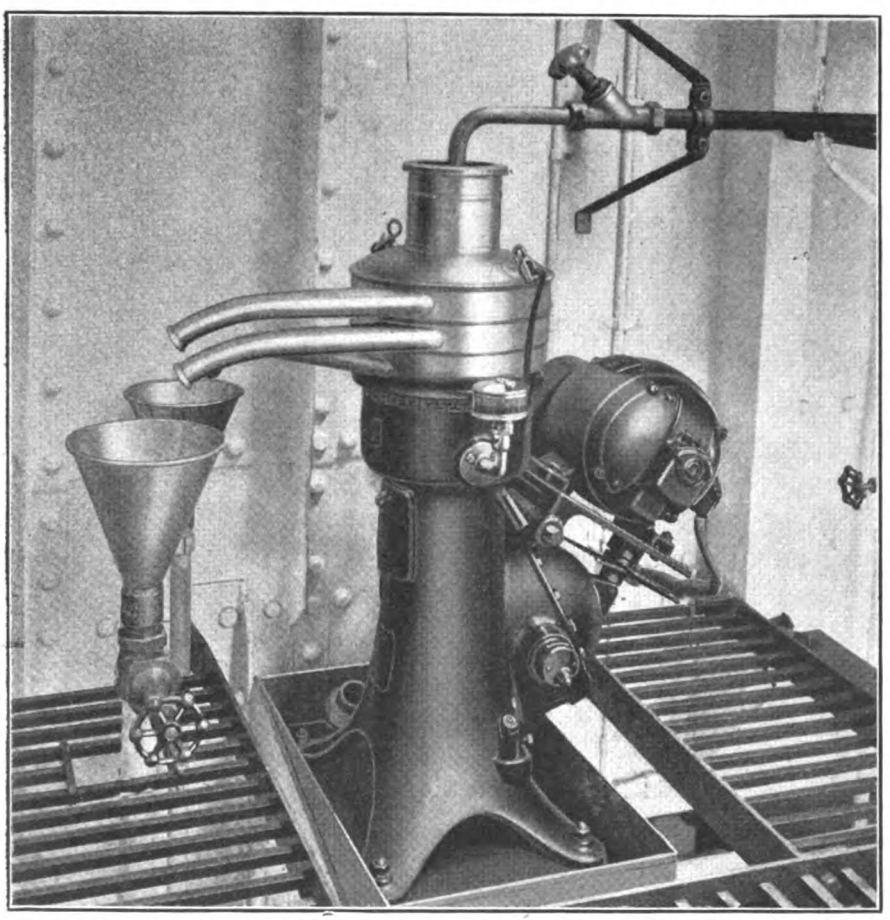
purifiers which, of course, keep a large quantity of impurities from reaching the engines at all.

In this connection we are reminded of a certain diesel driven ferryboat which some time ago was laid up by reason of the fact that the only fuel oil on hand was so badly contaminated with water and dirt that it could not be burned. The ferry company had refused to equip this vessel with a centrifugal machine on the ground that there was no room for it in the engine room. It was found, however, that its disrupted service could be restored more quickly by the immediate installation of an oil purifier than by awaiting receipt of a new shipment of fuel oil. A small machine was put aboard and the boat was soon in operation again. This machine was found inadequate for regular service, however, and another purifier was added. With this increased capacity it became possible occasionally to purify the lubricating oil. Even with this more or less spasmodic system of purifying lubricating oil, the engineer found that whereas it had previously been necessary to remove 0.012-inch shims from 24 connecting rods every two weeks, his engines ran for five months with no bearing adjustments whatever and at the end of that period it was impossible to remove more than 0.001-inch from seven bearings and 0.003-inch from the other 17. In other words, there had been less than one-fourth as much wear during five months of operation with purified oil as was formerly experienced in two weeks with unpurified oil.

As showing what experience will do, it might be added that still another purifier has been installed on this ferryboat, making three machines for a vessel which, it was thought to begin with, did not have room for even one.

So far we have not heard of any manufacturers of centrifugal oil purifiers selling their product as a substitute for new diesel engines although judging from the following they might at times well do so. One of the motor driven tankers of a large oil company is equipped with two 2400 indicated horsepower diesel engines which are about 15 years old. The design of the engines is such as to leave the crankcase wide open to fouling from carbon and to make matters worse there are numerous leaks in the cooling system which admit salt water to the oil. Such water is, of course, bad in any engine but in this case the quantity admitted is so large that salt crystals form in the lubricating system.

A centrifugal oil purifier of small capacity was put on this vessel some years ago with the result that the behavior of the engines was very much improved by the removal of 35 to 50 pounds of sludge and a large quantity of water every day. Looking back at the engine's performance before the oil purifier was installed, the chief engineer of the vessel decided that he would never again put to sea without a similar machine. Imagine his feelings, when in the course of overhauling the engine room machinery after a long cruise, a heavy engine part was dropped on the oil purifier putting it out of commission. The date of sailing was but a couple of days off and when he was told that it would be impossible to repair the purifier within the alloted time, he immediately went to headquarters and put up the battle of his life for a brand new purifier of larger capacity. He not only got the machine but had it installed and in operation before his ship left New York harbor. On his return the original purifier had been repaired and was installed to work on compressor oil, making two purifiers for the ship.



CENTRIFUGAL OIL PURIFIER FOR LUBRICATING OIL ON THE M. S. GULFCREST FITTED WITH TWO 1600 BRAKE HORSEPOWER NEW YORK WERKSPOOR ENGINES—SAID TO BE THE LARGEST MOTORSHIP BUILT IN AN AMERICAN SHIPYARD

Remove Large Quantities of Sludge

The Lamport and Holt M. S. LINNELL, operating on the South American run to Buenos Aires is equipped with two 1800 indicated horsepower six-cylinder Burmeister-Wain diesel engines. The lubricating system contains about 2700 gallons of oil and a centrifugal oil purifier is installed to keep the oil clean. The sump tanks are next to the skin of the ship and the oil therefore assumes approximately the temperature of sea water. No provision is made for heating the oil before purification and owing to its low temperature when in northern water the purifier is operated only when the 100 degree mark is reached. This usually occurs three or four days out of New York when the ship gets into the warm waters of the Gulf stream.

This operating method together with the fact that the engineer has

(*Continued on Page* 86)

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MARINE DEPARTMENT

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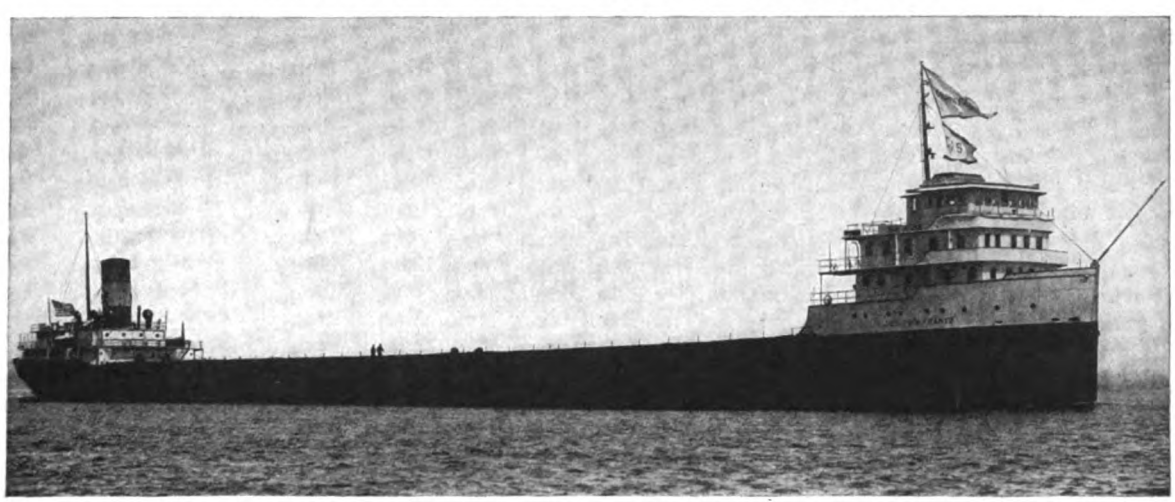
CAR-FLOATS

THE BABCOCK & WILCOX CO.

Manufacturers of Marine Water Tube Boilers Since 1895



Steamer "JOSEPH H. FRANTZ", The Columbia Steamship Company

Equipped with
Babcock & Wilcox Water Tube Boilers and Superheaters

THE BABCOCK & WILCOX CO.
Marine Department
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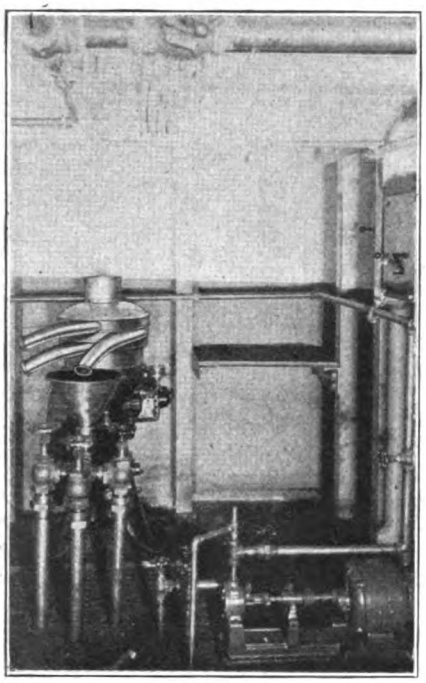
Oil Purifiers Needed

(*Continued from Page* 80)

kept a very careful check on the amount of oil purified and the quantity of sludge removed from the purifier, gives a good opportunity to show how fast sludge accumulates in the crankcase when purification is not continuous. The LINNELL'S engines are of a design calculated to prevent much dropping of carbon into the crankcase and the cooling system is



ONE OF THE TWO CENTRIFUGAL OIL PURIFIERS ON THE M. S. EAST INDIAN, USED FOR THE LUBRICATING OIL FOR THE TWO 2500 BRAKE HORSEPOWER SUN-DOXFORD ENGINES

so tight that very little water is removed from the oil. Nevertheless, on one voyage during which 2200 gallons of oil was purified, a total of 211 pounds of dirt was removed. Another trip, 74 pounds of dirt was removed from 1320 gallons of oil. Another showed 85½ pounds removed from 1340 gallons of oil and a fourth showed 92½ pounds of dirt removed from 1400 gallons of oil. The removal of this dirt has made it possible to keep the present charge of oil in service for nearly three years during which time no radical bearing adjustments have been necessary.

Perfect Lubrication on Long Trip

The J. W. VAN DYKE which recently completed without refueling, the longest voyage ever attempted by a vessel of this type, is equipped with a centrifugal oil purifier. The VAN DYKE is said to be the largest diesel-electric ship in the world and is owned by the Atlantic Refining Co. Her record-breaking voyage was from Philadelphia to Rio de Janiero, thence to Durban, South Africa and return, a distance of about 15,000 miles. At the end of this voyage an inspection of the bearings of her three 840-horsepower Ingersoll-Rand oil engines, which are of the oil-cooled piston type, showed it to be unnecessary and indeed impossible to make any adjustments so perfect had been her lubrication.

As indicating as to what might have happened, it is interesting to note that during the voyage the oil purifier removed from 40 to 45 pounds of dirt from the oil every twenty-four hours.

The statement of one engineer that his oil purifiers removed just about one ton of carbon from lubricating oil during a six-weeks voyage will appeal to those who like to think in big figures. Considering the fact that the engines on this ship are rather small, this record of carbon removal is extraordinarily high and obviously results from faulty engine design. We understand that this situation has since been corrected but cannot refrain from pointing out the fact that if the carbon had not continuously been removed from the oil by centrifugal purification, there would shortly have been nothing of the original engines left to correct.

Electric Winches, Reliable

(*Continued from Page* 74)

prove their worth for general cargo handling.

How Duty is Determined

In determining the "duty" of a suitable electric cargo winch, the following factors must be considered: average weight of the drafts of cargo usually handled; maximum weight likely to be handled on a single line; maximum load to be handled and number of parts of tackle available; desired tonnage capacity per hour. This determines the required rope speed and size of motor based on heating characteristics.

Most ship operators will emphatically state, when discussing electric winches for a ship they propose to build, that they handle heavier cargo or have more severe service than any other steamship lines using electric winches successfully. Usually a careful investigation and time study shows that their service requirements fall well within the range of the standard winch. Studies of many steam and electric winches in service show in almost every instance that the average draft handled is under one ton; that there are seldom more than two or three consecutive drafts of over two tons; and that it is very rare to find two stevedores who will handle more than three tons on a single line.

Using these facts for "rule of thumb" computation, the winch for general cargo handling should be designed for a rated load of about two tons with ample overload capacity to handle frequent loads of three tons and sufficient mechanical and electric strength to take occasional overloads up to five tons. Such a winch will not only handle the single line drafts but also the multiple port and derrick boom lifts up to about 30 tons. Above this, a heavier winch or additional gear reduction is generally used.

General cargo can seldom be handled at a greater rate of speed than 40 tons per hour. Frequently the winches are not run nearly to capacity but must wait for the stevedores to hook on the cargo or take it away. This fact has lead to the belief that a rope speed of about 200 feet per minute for average drafts is all that can be used to advantage unless the ship has very deep holds or handles continuously some light uniform cargo such as bag sugar or case oil which permits of high speed and high tonnage capacity. For the average winch, therefore, a motor rated at 25 horsepower on a 30-minute heating basis is found to be ample.

Electrical Equipment Necessary

The general outline of electrical equipment consists of a water tight motor, preferably series wound, but with compound winding if much winch head operation is expected; a shoe type solenoid brake; a straight line drive controller with overload and under voltage protection and with full dynamic braking control for lowering.

There is still much discussion as to whether the so-called cam type drum controller or the master switch with full magnetic contactor panel control is more desirable. A study of the two indicates that the magnetic control reduces current peaks, provides certain features of operation not found in the cam controller, is relatively fool proof in the hands of an inexperienced operator, requires fewer renewals of contact tips and is applicable for any horsepower. The cam controller presents fewer parts and much simpler construction, and is more readily understood by a third rate electrician or steam engineer. It gives satisfactory serv-

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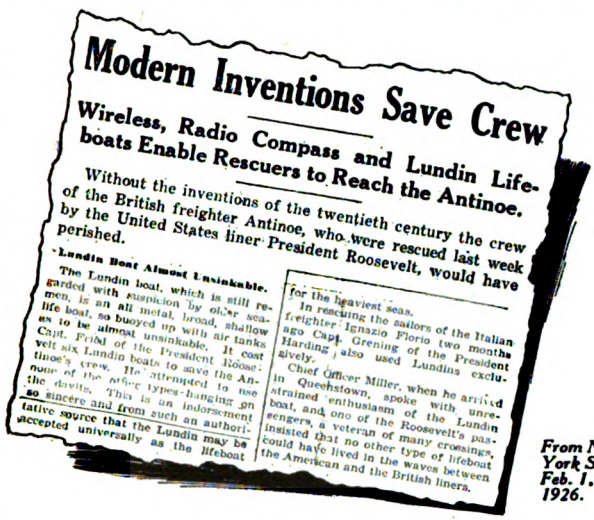
Lundin Life Boats
Saved Crew of Antinoe



Modern Inventions Save Crew

Wireless, Radio Compass and Lundin Lifeboats Enable Rescuers to Reach the Antinoe.

Without the inventions of the twentieth century the crew of the British freighter Antinoe, who were rescued last week by the United States liner President Roosevelt, would have perished.

Lundin Boat Almost Unsinkable.

The Lundin boat, which is still regarded with suspicion by older seamen, is an all metal, broad, shallow life boat, so buoyed up with air tanks as to be almost unsinkable. It cost Capt. Fried of the President Roosevelt six Lundin boats to save the Antinoe's crew. He attempted to use none of the other types hanging on the davits. This is an indorsement so sincere and from such an authoritative source that the Lundin may be accepted universally as the lifeboat for the heaviest seas.

In rescuing the sailors of the Italian freighter Ignazio Florio two months ago Capt. Grening of the President Harding also used Lundins exclusively.

Chief Officer Miller, when he arrived in Queenstown, spoke with unrestrained enthusiasm of the Lundin boat, and one of the Roosevelt's passengers, a veteran of many crossings, insisted that no other type of lifeboat could have lived in the waves between the American and the British liners.

From New York Sun. Feb. 1. 1926.

"THE Lundin boat is an all metal, broad, shallow lifeboat, so buoyed up with air tanks as to be almost unsinkable. Capt. Fried of the President Roosevelt attempted to use none of the other lifeboats hanging on the davits

and without the LUNDIN LIFEBOATS, an innovation of the last decade, Capt. Fried might have been forced to stand powerless on the bridge and watch the freighter go down with all hands.

This is a sincere and authoritative endorsement that the "Lundin" may be accepted universally as the lifeboat for the heaviest seas.

In rescuing the sailors of the Italian freighter Ignazio Florio three months ago, Capt. Grening of the President Harding also used Lundins exclusively.

Chief Officer Miller spoke with unrestrained enthusiasm of the Lundin boat, and one of the Roosevelt's passengers, a veteran of many crossings, insisted that no other type of lifeboat could have lived in the waves between the American and British liners."

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Sinking in mid-Atlantic—position reported approximately 100 miles in error—complete loss seemed to be the fate of the "SS. Antinoe."

But the "President Harding" and the "President Roosevelt," respectively, with the aid of the Kolster Radio Compass, quickly located these two vessels and robbed the sea of its human prey.

Locating vessels in distress is but one feature of the Kolster Radio Compass. Geo. R. Putnam, Commissioner of Lighthouses, considers the radio compass the most important navigational instrument provided for use on shipboard since the invention of the magnetic compass.

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ice up to perhaps 35 horsepower (depending on the voltage) and the contact renewals are not expensive and are easy to make. The installation takes up considerably less room.

The conclusion, therefore, is that where a ship is fitted with electric auxiliaries and mechanism throughout, such as on a large diesel or electric drive ship with an engine room crew competent to take care of them, the magnetic control is preferable, but where the winches are installed on a ship having practically no other complicated electrical equipment and having a crew generally unfamiliar with such electrical equipment, the cam control is desirable.

A description in some detail of several of the latest types of electric winches built by the Lidgerwood Mfg. Co. will show how the general principles outlined above have been reduced to successful practice.

Winches for Shipping Board

Probably the most interesting winches are the 140 cargo winches (illustrated in Fig. 2) and the 14 combined cargo and warping winches recently completed by the Lidgerwood company for installation on the 14 vessels which the Fleet corporation is converting to diesel drive. These winches are the result of a great deal of careful study by the Fleet corporation engineers and the engineers of the Lidgerwood company in regard to details of design. They are based on specifications compiled from the study of a vast amount of actual cargo handling data obtained on many types of both steam and electric winches.

These winches have a single drum 16 inches in diameter with a 20-inch face and a single 12-inch diameter winch head. The drum shaft is driven from the motor through a double reduction of spur gearing having accurately machine cut teeth. The gears and pinions are all steel. They run in an oil tight cast iron housing made as part of the winch frame. One of the novel features is that the gears splash in an oil bath insuring constant lubrication and long wear. The oil is splashed by the gears into upper reservoirs or gutters which feed a continuous flow of oil to the intermediate and drum shaft bearings on the gear side. The other drum shaft bearing is flange oil lubricated from a large bearing reservoir.

All bearing boxes are accurately bored and lined with shells of Sumet bearing metal. The winches are unusually quiet running and have been thoroughly tested to run at any list up to 15 degrees. The very effective rope guard may be noted in the illustration Fig. 2. The electrical equipment is arranged for 230 volts direct current. All electrical parts were furnished by the Westinghouse company except the solenoid brakes which were built by Cutler-Hammer Mfg Co.

The motors are water tight of heavy mill type construction, rated at 25 horsepower, 250 revolutions per minute and ½ hour, 75 degrees centigrade rise. The control for the winches on ten ships is of the cam type; on two ships, the full magnetic type and on the other two ships, a newly developed quick make and brake drum control (the design of Mr. J. T. Welsh of the Fleet corporation) the result of which will be interesting to watch. The winches were designed for a duty of 3900 pounds at 185 feet per minute. From the rope speed curve on the chart, Fig. 3 it will be seen that the average load of 1500 pounds can be handled at the very fair speed of 275 feet per minute and the light hook can be handled at speeds up to nearly 500 feet per minute which is very important for fast cargo handling. The winch is capable of handling a maximum load of 10,000 pounds and has been tested under this load.

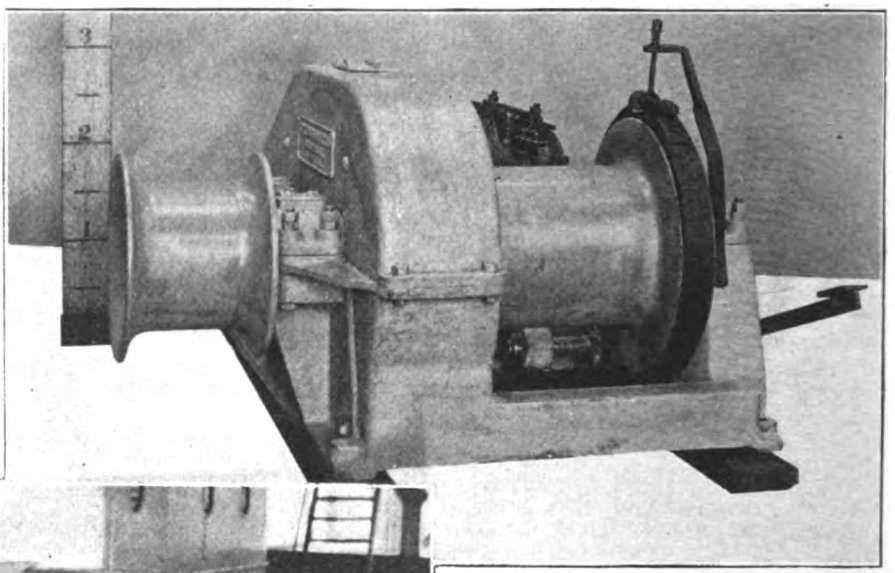

FIG. 4—ELECTRIC CARGO WINCH FIRST INSTALLED ON THE M. S. SUPHENCO

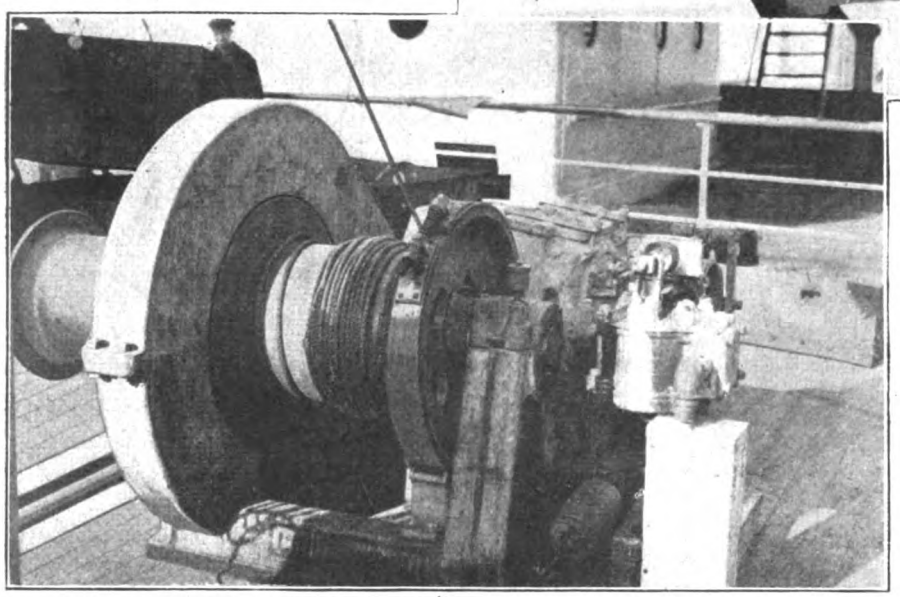

FIG. 5—SINGLE GEARED ELECTRIC WINCH ON THE M. S. EAST INDIAN

A Standard Marine Winch

A winch similar in general type to that described above but without the unusual refinements is illustrated in Fig. 4. The gears are totally housed but do not run in oil. The bearings are bronze shell lined but lubricated by oil cups in the usual way. A foot operated band brake is mounted on the drum flange for emergency use. A slightly lower efficiency is expected than on the Fleet corporation winches so it is given a duty rating of 4000 pounds at 165 feet per minute but the rope speed will follow quite

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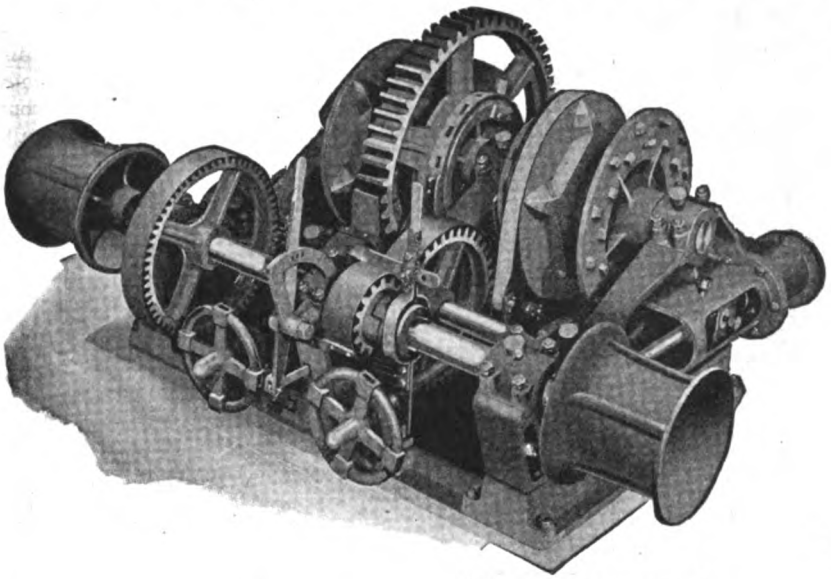

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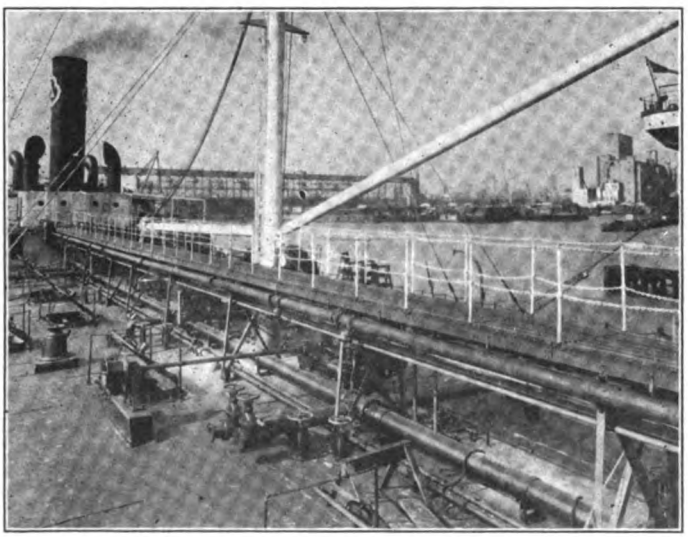

Deck lines in the past have been left uninsulated because there was no practical protection for the insulation. You can now insulate your deck lines, cover with Thorkote, and profit by the fuel savings to be derived. Illustration shows S.S. Hagood, with deck lines protected by Thorkote.

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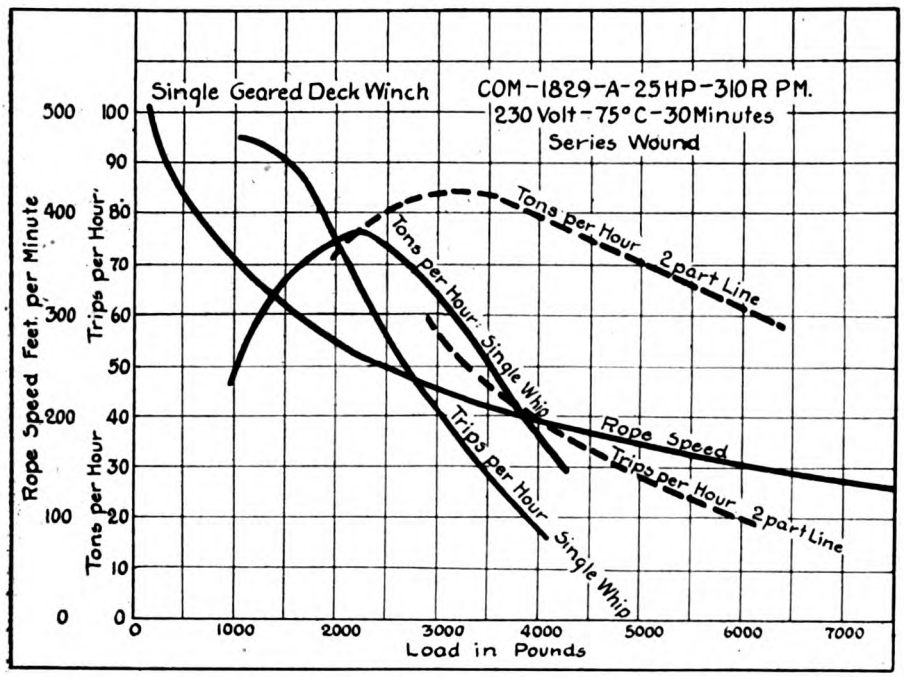

FIG. 6—DUTY CURVES OF SINGLE GEARED ELECTRIC WINCH ON M. S. EAST INDIAN

closely the curve shown in Fig. 3. This type of winch was first built for the M. S. SUPHENCO but has been found quite popular and has been installed on a number of ships including all of the new Clyde line ships and will be used at the 'tween deck hatches on the new International Mercantile Marine Co.'s electric drive ship now building at Newport News. These winches are generally built with a 25-horsepower motor running at from 490 to 600 revolutions per minute but can accommodate motors up to 35 horsepower. They have been built with various type of control including Cutler-Hammer drum control, Westinghouse cam type and General Electric magnetic type.

A New Fast Winch

The winch shown in Fig. 5 is of a new design recently developed by the Lidgerwood company and the General Electric Co. It was first installed on the M. S. EAST INDIAN and will be used for the top deck winches serving the deep holds on the new International Mercantile Marine ship. It has long been realized that to handle uniform light cargo fast and from deep holds, the winch must not only have high rope speed but must have a motor designed with sufficient heating capacity to handle a large tonnage per hour.

Even though the ship handles mostly light cargo, the winch must be suitable for general cargo as well. To meet this problem, the General Electric Co. developed a special slow speed heavy duty motor which has a nominal rating of 25 horsepower at 310 revolutions per minute but has the capacity to handle a large tonnage per hour and to carry a heavy overload rating.

The motor mounts a heavy solenoid brake and is controlled by full magnetic control incorporating all protective features and having automatic series relay acceleration and dynamic braking control for lowering. The winch has a single drum 16 inches in diameter with 20-inch face keyed on a very stiff and heavy drum shaft mounted in bronze bushed bearings. The drum is driven from the motor through a single reduction of machine cut spur tooth gearing, having a ratio of 6 to 1, totally enclosed in a cast iron housing. The winch is also usually equipped with a non-burn lined foot operated band brake for emergency use and one 14-inch diameter winch head. The winch has very high efficiency and correspondingly low current consumption. An efficiency of over 93 per cent was obtained during actual cargo handling on shipboard while handling loads of a little over a ton. The winch is designated to handle 1500-pound loads at over 300 feet per minute, 2-ton loads at 200 feet per minute, and is capable of handling up to 7500 pounds on a single line. The curve sheet, Fig. 6 shows an exceptionally high tonnage capacity of 70 to 75 tons per hour when handling the average load of 1500 to 2000 pounds; and the winch will keep up this capacity all day.

There are special winch services for small package freight boats and for bridge deck installation on larger vessels where nothing but light cargo is handled. A complete line of winches is built for these purposes, ranging from a winch using a 5-horsepower motor and handling 1000-pound loads up to 20-horsepower winches handling maximum loads of 5000 pounds. These winches generally have a rated rope speed of about 150 feet per minute.

Winches for Special Service

Although the cargo winch is of the greatest general interest in the electric winch class, there are a number of other types of electric winches designed for special services. A winch for handling the life boats is quite generally used. Two types are shown in Figs. 7 and 8. The former is a single reduction worm geared winch with the gearing running in an oil tight housing; the latter has a double spur gear reduction. For vessels car-

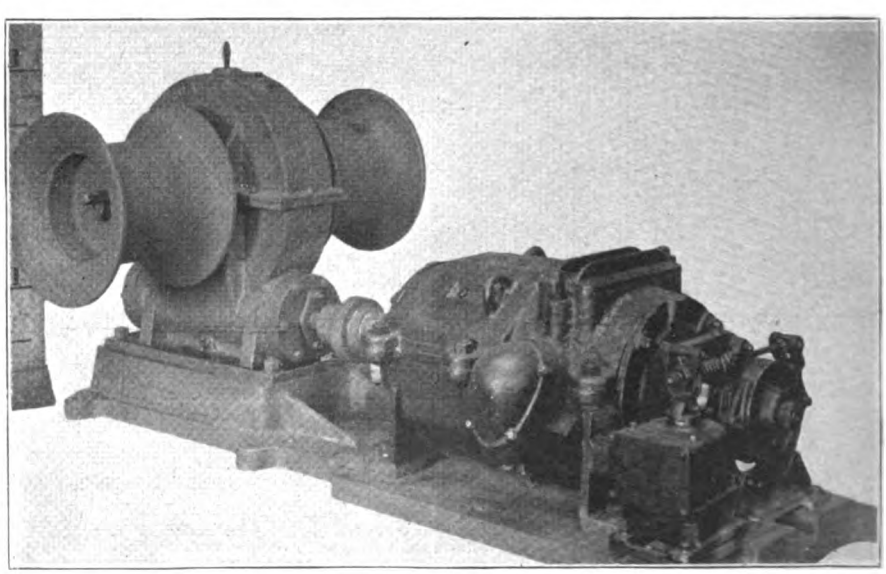

FIG. 7—WORM GEARED ELECTRIC BOAT WINCH

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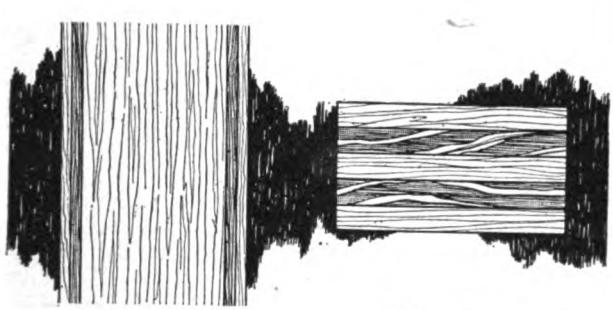

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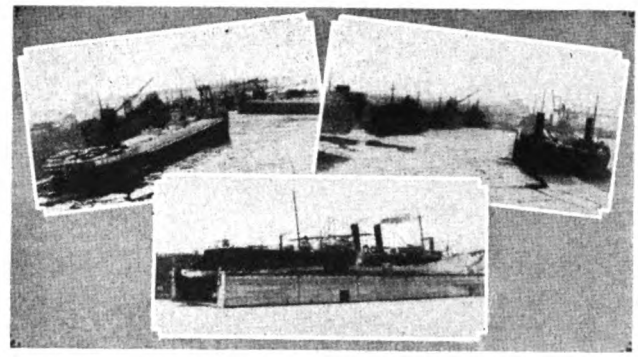

(Group of three views showing winter scene at Manitowoc)

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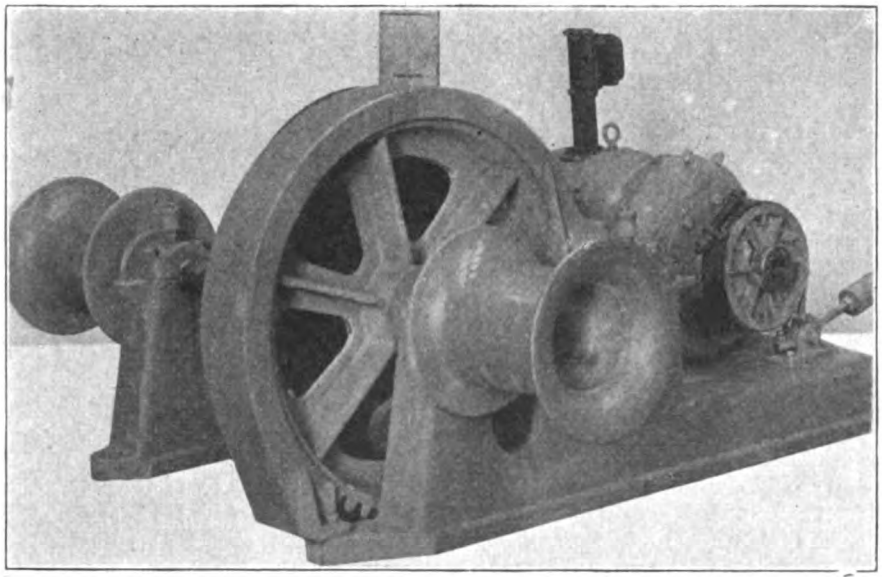

FIG. 8—SPUR GEARED ELECTRIC BOAT WINCH

rying large life boats, these winches are generally built for duties of 3000 to 5000 pounds at about 120 feet per minute rope speed and use 15 to 25-horsepower motors. With 4 or 6 parts in the boat hoist tackle, this means a handling speed of the boat of 20 to 30 feet per minute. They are sometimes furnished with push button control and continuous running heads and sometimes with drum controller and full rheostatic control.

Another type of winch often used is the warping winch usually mounted on the after deck. On cargo vessels, the warping shaft is frequently combined with a cargo winch. Tankers often use a special winch as shown in Fig. 9, sometimes with shaft extended for mounting the winch heads on a wider spread to clear the deck house. For average sized vessels, these winches are generally required to have a rope pull of 10,000 pounds. On very large vessels, the pull sometimes goes up to 20,000 pounds. They are generally desired to have a full load speed of 40 to 60 feet per minute and to pull in the light line at 100 to 125 feet per minute. Their service is of course intermittent.

Mooring Winches On Great Lakes

On the Great Lakes, the bulk cargo vessels require about six automatic mooring winches to handle the vessel in the locks and at the docks while loading and unloading. Some people think that the use of the diesel engine for propulsion in the Great Lakes ore carriers has been retarded awaiting the development of successful electric mooring winches as these are very important in the operation of the vessel.

The service of these winches at the dock consists of maintaining a constant pull on the mooring lines to keep the ship breasted into the dock and at the same time, winding in or paying out hawser as the boat rises or falls, due to being unloaded or loaded. The winches must also warp the vessel along the dock to spot the hatches under the loaders.

Probably the most severe service on the winches is their use as a ship's brake to check or snub the vessel as it enters the locks of the canals. For the 600-foot ore carriers the winches must be capable of maintaining strains in the mooring lines up to about 12,000 pounds and offer a resistance for snubbing the vessel of 15,000 to 18,000 pounds. All parts of the winch must be strong enough to withstand the breaking strain of the 1⅛-inch mooring line generally used which is about 64,000 pounds. They should be capable of speed control at the docks of from 25 to 100 feet per minute and to pay out or wind in light line at about 300 feet per minute. They must also be capable of being overhauled by the vessel entering the locks at a speed of 4 to 4½ miles per hour.

The Lidgerwood company installed electric mooring winches originally on the Ford Motor Co.'s diesel ore carriers BENSON FORD and HENRY FORD II. These winches were worm geared with a long thread worm taking its thrust against a heavy coiled spring which responded to variations of tension in the hawser. The longitudinal movement of the worm was used to operate a master electric controller operating a magnetic control panel to start the motor and correct the hawser variations. The load is held on the solenoid brake and no electric current is used except when the line is actually winding in or paying out. The line tension is adjustable by the operator for any value.

A New Type For Mooring

When the winches were built, all of the above listed duty requirements were not known and though the winches worked well at the docks, they would not pay out fast enough at the locks due to the self locking characteristics of the worm gearing, broke the mooring lines, and proved unsatisfactory. Following these, the Benson Electric Co. built some spur geared winches which have now been in service for two years. These winches gain their tension control by the whole winch rolling on rails on the deck against coil springs. The disadvantages lie in the movement of the large mass across the deck and the fact that readily adjustable variable tension control is not obtainable. The Lidgerwood Mfg. Co. has recently developed and built a new type for this service.

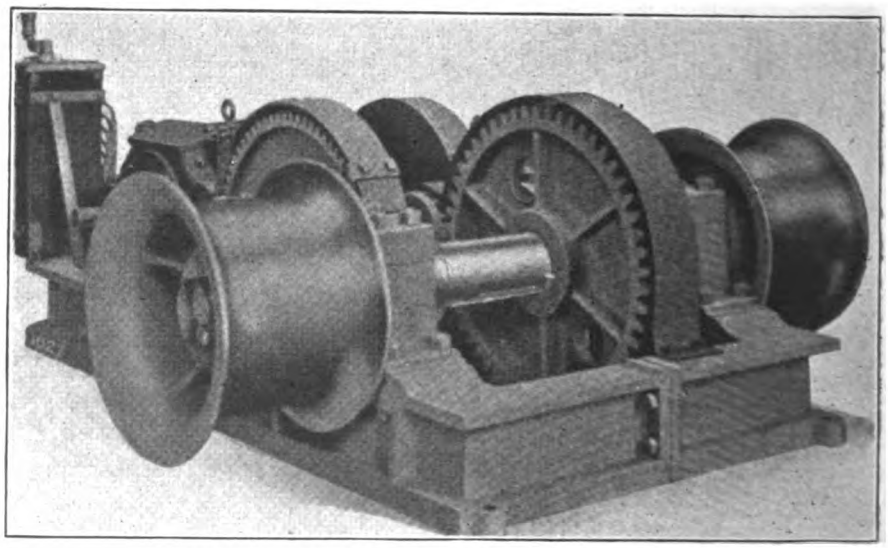

FIG. 9—TRIPLE GEARED ELECTRIC WARPING WINCH

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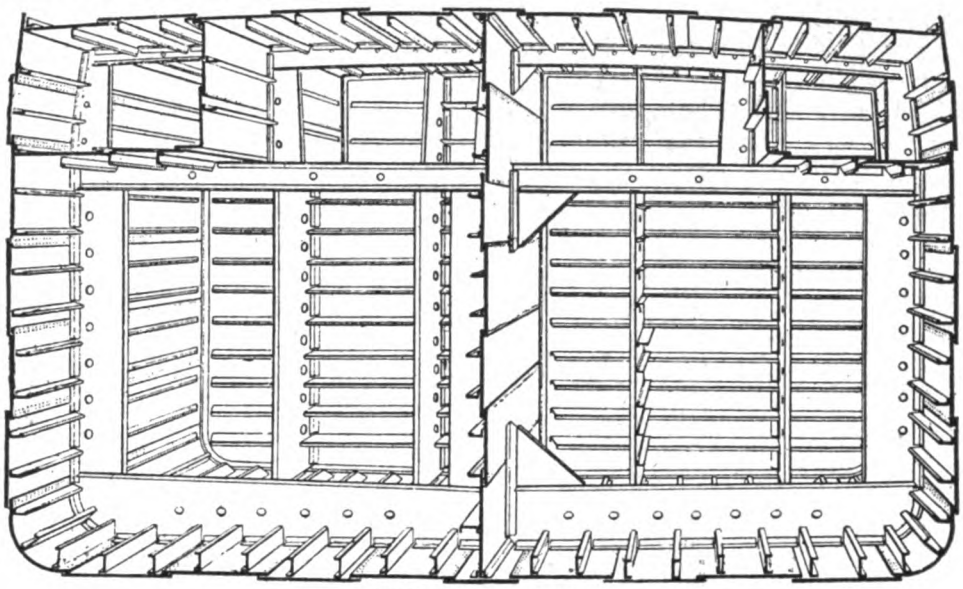

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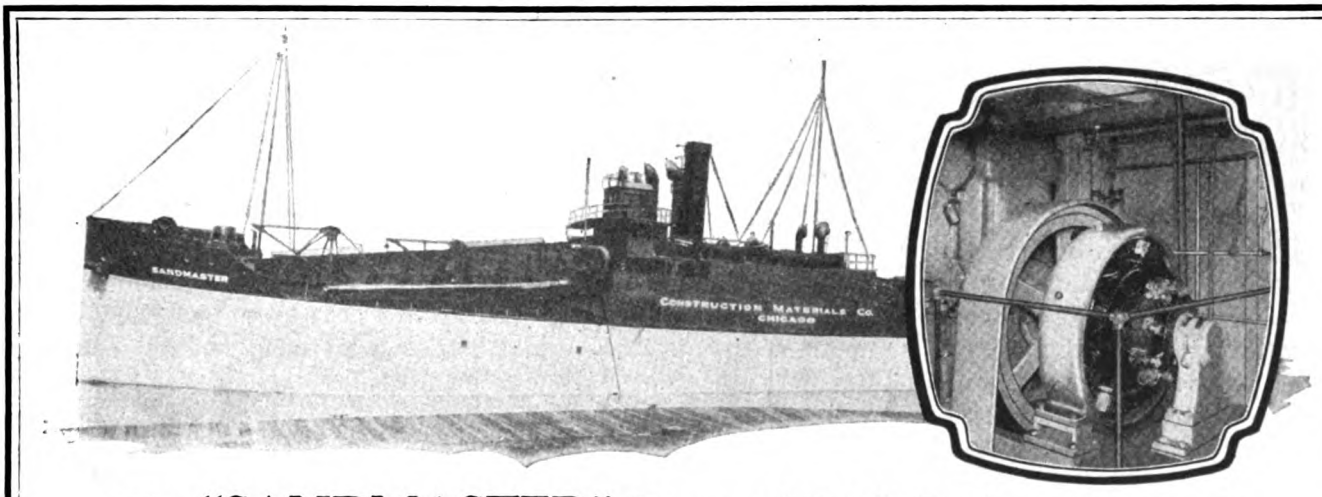

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Diesel Engines Are Used

(*Continued from Page* 13)

In the first classification involving powers of from 3000 to 20,000 and in an exceptional case like the LEVIATHAN up to 60,000 horsepower no application of the diesel engine has been made. Use of the diesel engine in ships of this classification is making rapid headway abroad particularly in Great Britain, Italy and Sweden.

Though a few important installations of diesels have been made in privately owned ocean cargo vessels such as the EAST INDIAN, CUBORE, CHALLENGER, SEEKONK, SUPHENCO, ASHBY and JACKSONVILLE, the most ambitious program along this line is the conversion now underway of 12 ships by the shipping board.

Private initiative has been more marked in the case of ocean tankers. Diesel engines have been used for at least two vessels and in a number of conversions. Among these are the twin-screw tanker GULFCREST, and one now building, the converted MILLER COUNTY, BIDWELL, LIO, J. W. VAN DYKE and LOS ALAMOS.

No Diesels in Coastwise Ships

No coastwise passenger and cargo vessel of which a number have recently been constructed has been fitted with diesel engines. So far there has been no competitive incentive to do so. Once someone takes the initiative and demonstrates greater economy of operation others will undoubtedly follow.

On the Great Lakes where coal is comparatively cheap and is carried very often one way as cargo the day of the diesel would seem to be remote. However, two 600-foot bulk carriers built two years ago are fitted with diesel engines. They have operated with great regularity and at a low fuel cost. First two and, after a thorough tryout for two years, two more special Welland canal size freighters fitted with diesel engines are now operating on the St. Lawrence and the Great Lakes. In this case there can be no question that careful observation of the operation of the first two convinced the owners of their economic superiority over steam driven vessels for this service. Two vessels with diesel-electric drive were built three years ago for operation from the Great Lakes through the barge canal to New York.

In smaller vessels, listed in item seven above, diesel and diesel-electric power are rapidly replacing steam. The excellence of a number of smaller engines and the fine engineering work carried on by the larger electrical companies have firmly established the economic superiority of these types of drive. Six diesel-electric ferryboats are now under construction in one shipyard, and within the last few days two companies on the Pacific coast have ordered a total of seven diesel-electric ferries. The growing needs of our own domestic trade for transportation by water cannot be overemphasized. Present equipment, much of it old and antiquated, must be replaced and additional units must be provided.

Traffic on our inland rivers is growing rapidly. The government is carrying out extensive programs of improvement. In the last seven years tonnage carried on the Ohio river increased 350 per cent. A number of installations of diesel and diesel-electric drive have already been made.

It is difficult to visualize the tremendous fleet of tugs and harbor craft needed for our many great seaports and inland waters. Within the last two years the use of the diesel engine in boats of this class has increased rapidly and the results obtained have created confidence in its superiority over steam. The diesel-electric drive has been installed in a number of tugs with excellent results. One large railroad company with extensive floating equipment has thoroughly demonstrated the efficiency, flexibility and maneuvering ease of this type of drive. Two other railroads are now building tugs with diesel-electric drive.

A number of privately owned tug boats at seaports and on the Great Lakes have been fitted with diesel direct drive with uniform success. So thoroughly have these installations been justified by experience in service that no new tug would be built today without giving serious consideration to the use of the diesel engine as power.

Favor Diesels in Special Craft

The service of a fireboat makes the use of the diesel engine particularly suitable. A recent example is the fireboat CITY OF HOUSTON. No fireboat would be designed today without a careful study of the possible use of diesel-electric power.

Diesel and diesel-electric power for hydraulic dredges and sand suckers is firmly established. The advantages over steam are so definite that it is no longer a debatable question except on the possible basis of first cost. However the service rendered by boats of this class is generally such that convenience and efficiency outweigh any difference in cost.

Though it may take many years to build up a privately owned merchant marine on the high seas the American operator can depend with confidence on the genius and the skill of the shipyards and the engine builders of the country to provide him with ships equal to the best Europe can turn out. If this is not so we cannot hope to regain our ocean carrying trade.

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